McGRAW-HILL DIGEST

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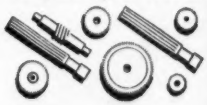
PETROLEUM PROGRESS by Socony-Vacuum

S/V Sultrans are important examples of Socony-Vacuum progress in the field of petroleum.

Products of our vast research laboratories, these new transparent cutting oils mean far better visibility in precision cutting—possess high lubricity, exceptional anti-weld properties. Result: Longer tool life—higher production, fewer rejects—*lower over-all costs* in machine shop operation.



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Socony-Vacuum research enters many fields. Today, Socony-Vacuum's amazing new Process Products are at work in 30 basic industries: a special new "bubble breaker" speeds penicillin production . . . a new ceramics glaze binder reduces blistering and cracking, cuts mixing time to about one-third of normal . . . a highly concentrated wax emulsion makes sportswear, lawn furniture, curtains, raincoats and umbrellas water repellent!

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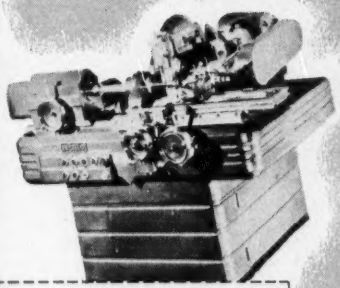
26 BROADWAY, NEW YORK CITY, U. S. A.

Here is how to make the things YOUR COUNTRY NEEDS



PURCHASE FROM UNITED STATES WAR SURPLUS THE MACHINES THAT MAKE MACHINES

Listed below are 31 types of general production machine tools. With these tools you can build parts to make other machines—shoe repair—bakery—sewing machines—refrigerators, wheels—gears—motors—engines—the kinds of equipment you need to make living easier and pleasanter. Your U. S. buying agent can help you get these machines immediately at prices far below normal selling prices for such tools. The machines are not new, they were used in war production, but they average only 2½ years old. Furthermore prices are so low that you can have them completely rebuilt in the United States and still save money. Write your U. S. agent today and ask him to buy from WAA the kinds of machine tools you need for the enterprises you have or are starting.

CHECK THIS COMPLETE LIST

If tools of the type you need are included, write your U. S. Buying Agent and ask him to obtain detailed buying information for you from any of WAA's 33 offices.

Boring Machine—Horizontal, Precision, Bridge Type, Single and Double End. (Bores accurate holes through metal)

Chucking Machine—Automatic, Vertical, Multiple Spindle Type. (Performs several chucking operations in sequence)

Chucking Machine—Single Spindle Automatic, Horizontal Turret Type Machine (Bores—rounds and threads metal pieces)

Chucking Machine—Six Spindle Automatic, Horizontal. (Performs several chucking operations in sequence)

Drilling Machine or Drill Press—Bench or Floor, Single or Multiple Spindle. (Drills various size holes in metal)

Gear Cutting Machine for Straight Bevel Gears. (Not Planer Type)

Gear Hobber—Horizontal. (Cuts ordinary gear teeth)

Gear Hobber—Vertical, Universal.

Gear Shaper—For External Spur Gears Only. (Cuts precision gear teeth)

Gear Shaper—For Spur Gears, External or Internal.

Gear Shaper—For Spur and Helical Gears, External and Internal.

Gear Tooth Shaver—For External and Internal Gears (Rotary Type Machine)

Gear Tooth Grinder—Generating Type, For Spur and Helical Gears.

Gear Tooth Grinder—For Spur Gears, External and Internal. (Formed Wheel Type Machine)

Grinders—Centerless. (Automatically grinds any round piece to precision size)

Grinder—Crank Pin Grinders.

Grinders—Plain External Cylindrical Grinder.

Grinder—Internal, Cylindrical, Automatic Sizing.

Grinder—Internal Cylindrical (Hydraulic Feed Machine)

Grinder—Internal Cylindrical, Hydraulic Feed, for Hole and Face Grinding.

Grinder—Surface, Rotary Table Type.

Lathe—Multiple Tool, Not Automatic, Manufacturing Type Production Lathe.

Milling Machine—Automatic and Manufacturing Knee Type. (Makes straight cuts across metal surfaces)

Milling Machine—Plain Bed Type, Horizontal Spindle Machines.

Milling Machine—Vertical, Knee Type (Not including Bench Type)

Polishing and Buffing Machine—Bench and Floor.

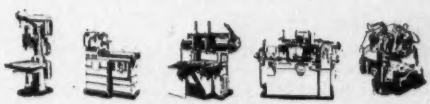
Profiling Machine—Vertical, Fixed Bed Type, Single and Multiple Spindle. (Mills odd shapes)

Tapping Machine—Vertical, Single or Multiple Spindle. (Threads holes)

Thread Grinding Machine.

Thread Milling Machine.

Turret Lathe—Ram Type, Plain and Universal. (Performs multiple lathe operations)



Although Export Branches have been established in the Regional Offices shown below, purchases may be made at any of War Assets 33 Regional Offices. Buying agents should be authorized to arrange appropriate inspection, reconditioning and packing as may be required.

WAR ASSETS ADMINISTRATION

GOVERNMENT OWNED SURPLUS

Export Branches: Boston, Massachusetts • New York, New York • Philadelphia, Pennsylvania • Chicago, Illinois • New Orleans, Louisiana • Seattle, Washington • San Francisco, California • Los Angeles, California • Cleveland, Ohio Houston, Texas • Detroit, Michigan

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Order Through an American Agent

• We solicit your appointment of J. PARKER THOMPSON CO., INC. as your Buying Agent in the United States for whatever you wish to purchase from the WAR ASSETS ADMINISTRATION War Surplus Stocks, no matter what the kind of item. You will note that the WAR ASSETS ADMINISTRATION advertisements advise, "Instruct your United States buying agent to communicate with the nearest W.A.A. office, etc."

$1,000,000.00 PURCHASED

During 1946 we purchased approximately $1,000,000.00 worth of equipment direct from the WAR ASSETS ADMINISTRATION war surplus stocks. These purchases were made by us from WAR ASSETS ADMINISTRATION depots located in many of the states of the Union, and exports were made from New York, New Orleans, San Francisco, Seattle and Los Angeles.

NEW EQUIPMENT

In addition to WAR ASSETS ADMINISTRATION war surplus stocks we can furnish you with almost any type of Electrical, Power, Industrial and Construction equipment from American manufacturers whom we represent.

This equipment represents the latest type manufactured, and in many instances can be shipped promptly.

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Our Engineering Department will design and furnish specifications for the erection of any character of industrial or municipal plants or factories of any size.

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Our Inspection Department is equipped to make inspections for your account of any machinery purchases which you may make in the United States from other companies. Our fees are moderate and our service is technical and dependable.

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CABLE OR AIR MAIL—*Cable or air mail us your requirements, providing us with the fullest possible description. These war surplus stocks are moving fast. Do not delay in letting us hear from you. We are glad to quote you on your inquiries whether they are small or large.*

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Cyclone Burner Cuts Costs

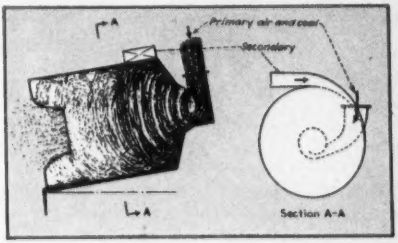
Reduces power-plant construction and operating expenses; uses low-grade fuel. Whirls burning coal and air to throw out slag, easing ash problem

Important savings in boiler maintenance, size, and weight, as well as building volume, are indicated for the radically new cyclone furnace at Calumet Station of Commonwealth Edison Co. More than 80% of the ash in the coal is segregated as molten slag in the burner itself, and its continuous removal in molten form greatly simplifies ash handling. Reduced quantity of fly ash in the stack gases (only 600-700 grains per 1,000 cu. ft.) requires, if anything, only a greatly simplified form of dust-separation equipment. The relatively clean combustion gases permit rearrangement of heat-absorbing surface with substantial reduction in size and in equipment and labor for cleaning the surface. First cost, as well as operating and maintenance expenses, of coal crusher is lower. It appears feasible to operate such units with the products of combustion under pressure, with possible elimination of the induced-draft fan.

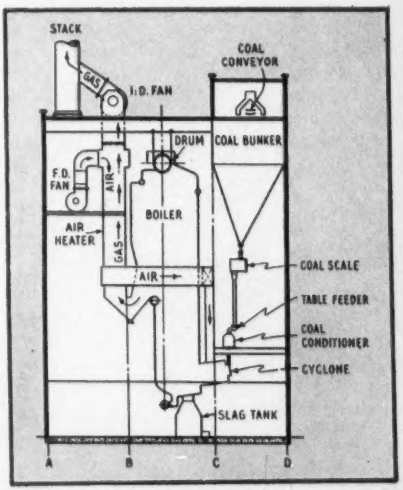
For a 75,000-kw. plant, the cyclone burner would reduce floor area 25%, building volume 33%, weight 22% compared to a pulverized coal-fired, high-pressure, high-temperature steam generating unit. Combined with other savings, these cut capital cost by $6 to $6.50 per kw., or $500,000 for a 75,000-kw. plant.

The Calumet cyclone burner was installed in conjunction with a radiant boiler following pilot-plant tests. It is 8 ft. in dia., 11 ft. long, slopes 5 deg. to drain the slag. It has a primary air and coal inlet port on the front end, secondary air port section along the upper burner periphery, and an outlet throat section to discharge the hot gases into one boiler. A continuous slag tap opening is provided at the bottom.

Primary, secondary, and tertiary ducts furnish 30- to 40-in. water pressure. Coal is crushed to No. 4 mesh. The heated (450°F.) air results in high combustion rates, and the ash is deposi-



Low-grade crushed coal and air enter the radically new cyclone burner with a whirling motion and burn. Slag is thrown to wall and drains through tap at lower edge. Combustion products enter boiler furnace through center aperture.



Relatively simple cyclone furnace boiler promises to save 25% of floor area, 33% of building volume, 22% of boiler tonnage.

ted in a molten state centrifugally on the walls of the cyclone. The incoming coal is partly caught by the slag, and provides intense scrubbing of the high-velocity air on the entrapped coal particles. Much of the high rate of combustion is attributed to this action.

Coal ignition is obtained on starting by a removable air-atomizing oil burner inserted at the front in proximity to the periphery of the cyclone burner.

In a year's operation, burner maintenance has been a negligible operating factor. —POWER, ELECTRICAL WORLD

Progress in Welding

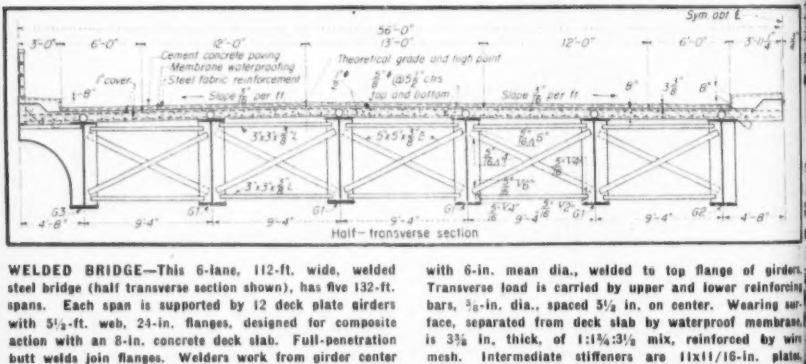
Resistance welding gains. New electrodes, gas shielding improve arc welding. Powdered metal welding and cutting advance. Arc-oxygen method important

Resistance welding has been adopted for mass production in practically every industry fabricating sheet metals. Steel plate up to $\frac{3}{16}$-in. thickness now is resistance welded. Where suitable power supply is not available, storage-battery resistance welders are available; an outstanding application is a new flash welder for aluminum.

In arc welding, lime-ferritic electrodes have new and important advantages. They now weld high-sulphur, air-hardening steels and complex alloys, some of which heretofore have been considered unweldable. Favorable impact properties are developed in the weld deposits.

Automatic arc welding has increased greatly, and new welding wires increase operating speeds. Specifications for small arc welders have been developed. Operating at a maximum load of 130 and 180 amp., these welders are suitable for farmers or communities served by 3-kva. and 5-kva. transformers, respectively. The carbon-arc torch is being used more widely on farms; its higher concentrated heat and ease of control enable relatively unskilled welders to do difficult jobs that are next to impossible with the metal arc.

In atomic-hydrogen arc welding, a new three-arc head permits faster work and better control of cooling temperatures. Inert-gas-shielded arc welding, first utilized for magnesium and aluminum, has been extended to most nonferrous and



WELDED BRIDGE—This 6-lane, 112-ft. wide, welded steel bridge (half transverse section shown), has five 132-ft. spans. Each span is supported by 12 deck plate girders with 5½-ft. web, 24-in. flanges, designed for composite action with an 8-in. concrete deck slab. Full-penetration butt welds join flanges. Welders work from girder center out. Deck is 8-in. thick, 1:2:3½-mix concrete. Horizontal shear is taken by patented $\frac{5}{8}$-in. round bar spirals, with 6-in. mean dia., welded to top flange of girders. Transverse load is carried by upper and lower reinforcing bars, $\frac{3}{8}$-in. dia., spaced 5½ in. on center. Wearing surface, separated from deck slab by waterproof membrane, is 3⅝ in. thick, of 1:1¾:3½ mix, reinforced by wire mesh. Intermediate stiffeners are 11x11/16-in. plate, welded to top flange of girders. Design is as strong and cheap as riveted design. —ENGRG. NEWS-RECORD

practically all ferrous metals except mild steel; it is particularly suited to stainless steel. Elimination of fluxes and their inherent cleaning difficulties definitely has developed a place for it in joining most of the nonferrous metals.

Many refinements have been made recently in the methods of introducing powdered metals into an oxyacetylene flame, eliminating both welding rod and flux. This technique also makes it easier to apply an overlay of hard metals; it can be used on a comparatively thin edge without distortion.

The past year has seen extensive use of the combination of a hollow metal electrode with an oxygen stream in arc-oxygen cutting. Nonferrous material may be cut with this method. The arc continually melts down the steel electrode, and the oxygen burns away the nonferrous material being cut. Only a tiny area is heated at one time, minimizing the heat effects on stainless steel.

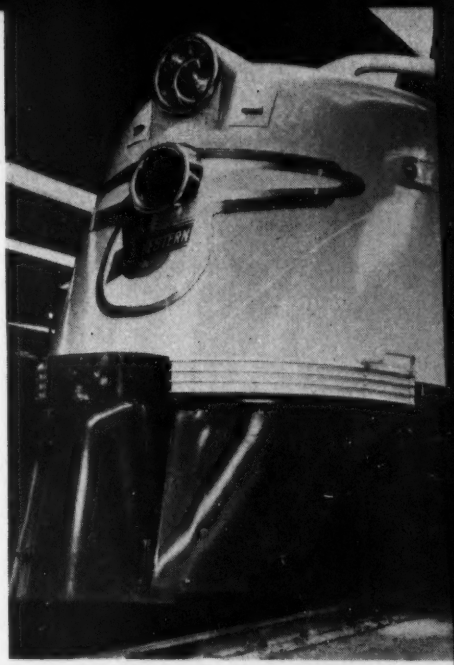
Nonferrous metals also are successfully flame-cut. Most important application is on stainless steels. A metallic powdered flux is introduced into the cutting-oxygen stream so that the oxyacetylene reaction will provide the necessary heating, melting, and fluxing to remove the refractory chromium oxide. Cutting speeds are about equivalent to those obtained on carbon steel. The process also can be employed to cut cast iron and the new high-temperature alloys.

New, Easy, Contact Method

Contact arc welding—as easy as melting a candle at a uniform rate against a ot plate—has been perfected by Philips' loeilampenfabrieken, Holland. The electrode is placed in contact with the workiece, a thumb-button pushed to close the ircuit, and the electrode moved along he joint, continuously in contact with he work.

A new electrode makes contact arc elding possible. The external diameter more than twice that of the core, giv- g an extremely heavy coating, containing a large amount of the core metal in the form of a fine powder and therefore more or less conductive. Half the molten metal for the weld comes from the core, half from the electrode.

The new technique permits welding to begin precisely at a fixed point; problem of arc-length maintenance is eliminated; coating is so thick that cup of rod is always deep and strong enough to keep core at such a distance from workpiece that it cannot "freeze"; with a given current, amount of metal deposited per unit of time is considerably greater; absorption of nitrogen and oxygen by weld is diminished because the arc is surrounded by the deep cup; left-hand, backhand, and overhead welding are made easy. —WELDING ENGINEER



OSCILLATING TRAIN LIGHT—Oscillating red signal lights, operating as train slows down, will be installed front and rear on all Chicago & North Western trains. When a train slows or stops, the lights will warn other trains. —BUSINESS WEEK

Promising Chemical Process

Fluidization in chemical reactions offers important advantages in other fields than catalytic cracking, where it is used to produce aviation gasoline

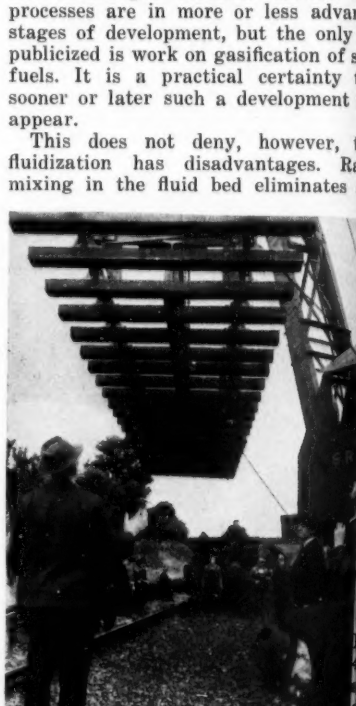
Acclaimed for its part in producing aviation gasoline during the war, the fluidization technique of conducting chemical reactions has intriguing possibilities in other branches of the industry. Fluidization is achieved by passing a stream of gas upwardly through a bed of suitably sized particles, throwing them into a state of vigorous motion similar to that of a boiling liquid. Advantages include:

1. Excellent temperature control—the body of solids serves as a thermal flywheel.
2. Excellent temperature uniformity—rapid mixing and frequent contact of the particles eliminate hot spots.
3. High heat transfer rates—of the order of those obtainable with boiling liquids.
4. High reaction rates — small particles mean increased surface for reaction, which surface is kept relatively free of gas films by the sweeping action of the fluidizing gas and by frequent collision of particles.
5. Possibility of moving large quantities of solids cheaply—amply demonstrated by present catalytic crackers; these solids can be thermophores as well as not.
6. Maintenance of a deep bed at reaction conditions—compare a nonfluid bed of solids moving slowly in countercurrent relationship to a stream of gas; there will exist a high-temperature zone preceded and succeeded by lower temperature zones where completion of the reaction may not be possible.

Fluidization is most likely to be used to advantage in processes in which conspicuous improvement is possible by: (1) Improving temperature control, thereby (a) preventing undesirable side reactions, (b) preventing loss of materials as by sintering of residues, and (c) improving quality or uniformity of product. (2) Improving heat transfer, thereby (a) increasing capacity and size of units (b) reducing external temperature on vessel, and (c) replacing external heating with thermophore. (3) Increasing reaction rates, thereby (a) increasing capacity of units and (b) lowering reaction temperatures.

No process has yet been commercialized which takes full advantage of the possibilities of fluidization in carrying out a solid-gas reaction. Several such processes are in more or less advanced stages of development, but the only one publicized is work on gasification of solid fuels. It is a practical certainty that sooner or later such a development will appear.

This does not deny, however, that fluidization has disadvantages. Rapid mixing in the fluid bed eliminates a



PREFAB RAILROAD TRACK—Britain's Southern Railway is using 60-ft., even-end prefabricated sections of track to replace worn rails, section being carried to location by flat-car. Crane, using a special I-beam suspension for added rigidity, swings lengths into place. Out-of-service-time is cut 50%; direct cost of renewal is reduced 13 1/2%. —BUSINESS WEEK

significant countercurrent action in a single bed, requires that the entire bed have the product composition, and encourages a certain amount of short-circuiting of raw material from entrance to outlet. In certain cases a single fluid reactor would have to be uneconomically large to obtain a commercially acceptable product. The cure may be the division of the fluid reactor into two or more zones between which countercurrent flow of solid and gas may or may not be enforced.

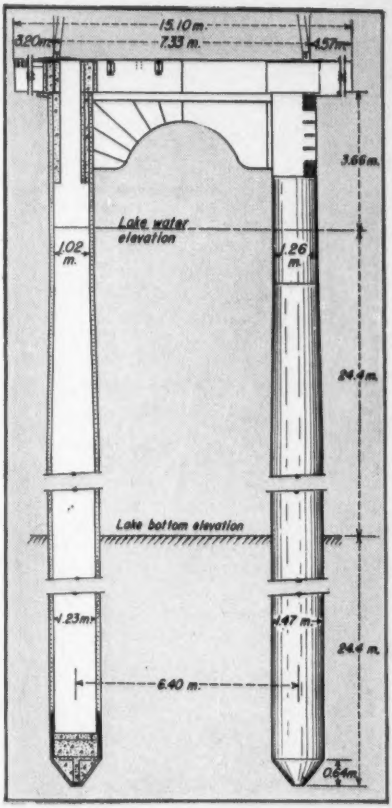
Maintaining a suitable particle-size distribution in the solid during all stages of processing can be troublesome because of shattering or reduction in size of particles, or from softening and subsequent agglomeration. A possible precautionary measure is the circulation of a large quantity of inert material to dilute the agglomerating effect. —CHEMICAL ENGRG.

HIGH-SPEED LOOM

Operating between 114 and 124 picks per min., a new 62-in., double-shed, pile-fabric loom, made by Aufhauser Brothers, can weave patterns requiring up to 14 harnesses and can be adjusted for either single- or double-lift jacquard heads. Two ground-warp and two pile-warp beams, 28 in. dia., can be used at the same time on the standard model, as can positive, compensating warp-let-off motion and a three-roll pile-let-off motion. Pile-cutting knife, mounted on wide rail, insures even cutting, stops vibration. —TEXTILE WORLD

PRECISE AUDIO METER

In measuring audio frequencies of 30 to 450 cycles, an instrument which combines a frequency divider, synchronous motor, and magnetic tachometer is 400% more accurate than commercial meters. Audio input frequency is divided by Eccles-Jordan scale-of-two trigger circuits to produce 2-phase output for driving the motor and tachometer. Motor speed is proportional to frequency, and tachometer indicates frequency directly with 0.5% accuracy. —ELECTRONICS



SUBMARINE OIL-WELL BASE—These poured-concrete, caisson-type foundations, with 1/4-in. steel liners, have solved problem of supporting derricks for submarine oil wells in Lake Maricaibo, Venezuela. Caissons are cast in 15-ft. sections as much as 8 mi. from erection site; a 4-in. steel-liner lip at each end extends beyond concrete for welding to adjacent sections. Lengths, up to 185 ft., are sealed off at ends and floated to well location. A floating, stiff-legged derrick with 145-ft. boom lifts sections into place. Caisson is filled with water, and weight sinks pile 20-30 ft. Concrete blocks weighing 50 tons each are added until column is supporting 200 tons, sinking column to desired depth, also testing load capacity. One column can be placed in 1 ½ hr. Arched-box welded-steel girders connect caissons; prefabricated steel platform placed atop caissons to support derrick weighs 25 tons. —ENGRG. NEWS-RECORD

WORLD SHORTAGE SEEN IN 3 NONFERROUS ORES

World reserves of copper, lead, and zinc ores are limited. At the 1935-39 annual rate of use, U.S. reserves of copper ore will last only 34 yr.; of lead, 12 yr.; of zinc, 19 yr. Assuming that production in other countries is increased to balance requirements, copper ore reserves outside the U. S. are good for only 33 yr.; lead, 17 yr.; zinc, 22 yr. It is recognized that estimates of reserves are conservative and that new discoveries and development of formerly uneconomic deposits may offset to a degree depletion of reserves. —ENGRG. & MINING JOURNAL

ADVANTAGES OF AIR GAGING

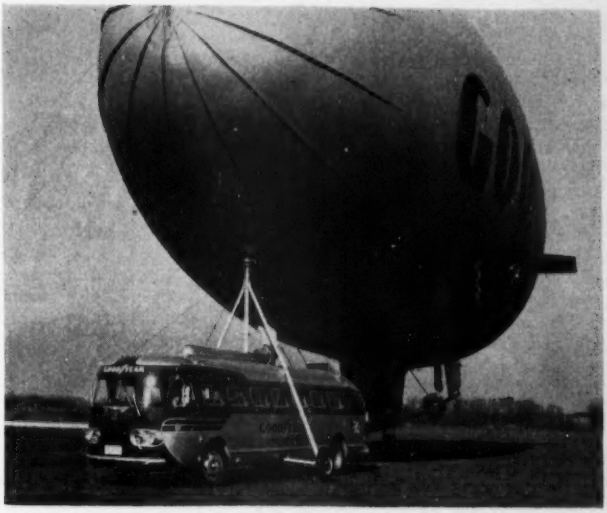
Modern air gages for metal parts are devices of extreme accuracy which may be used: (1) Independently of operator skill. (2) Usually without the necessity of cleansing parts to be gaged. (3) With gaging pressures sufficiently low to avoid part deflection. (4) Without marring soft polished surfaces. (5) Without loss of accuracy because of gage wear.

Air gages are economical because: (1) Wear life is extremely long. (2) Unquestioned accuracy prevents costly mistakes and arguments. (3) Accuracy prevents scrapping of many good parts, as well as preventing use of many bad parts. (4) Ease of operation allows use of lower skilled operators and inspectors. (5) Inspection is speeded without loss of accuracy. (6) One operator may do work of many by means of multiple applications. —AMERICAN MACHINIST

ELECTRONIC RECTIFIERS REPLACE MOTOR-GENERATORS

To reduce maintenance, avoid the power losses involved in dc. power transmission, and provide correct voltage for each machine, electronic rectifiers are mounted on individual production tools at Caterpillar Tractor Co. These are replacing motor-generator sets. To operate the magnetic chuck of a grinder, for example, two transformers supply filament and plate voltages to two CE-125 electronic tubes. Other parts include: 50-watt, 460/115-volt transformer for control circuit; timer to prevent loading rectifier until tube filaments have reached maximum temperature; thermal overload relay to protect tubes and transformers.

BUILT UNDERGROUND—This Swedish aircraft engine plant, built underground during the war, needs no exterior maintenance, usually is not heated, and will over a 30-year period prove 10% cheaper than a conventional above ground building. Workers prefer air-conditioned subterranean plants; temperatures are stable, drafts rare. Walls are hardboard lined, painted white, and broken by ersatz windows and potted plants. —AVIATION NEWS



MOBILE MOORING—Flxible Coach Co. has modified two of its 29-passenger buses as mobile mooring sites for Goodyear blimps. Remodeled, the bus contains radio transmitters and receivers for air-ground communication, two bunks, seat and luggage space for 21-man ground crew. —BUS TRANSPORTATION

a contact relay; fuse block; start-stop pushbutton station; and pilot light.

Whether operating at no-load or full-load, the rectifier has no effect on power factor; indicated efficiency is 75-80%; dependable, low-maintenance service is expected. —ELECTRICAL CONTRACTING

JACKS CUT TIMBERING COST

Steel screw jacks, resting on steel pins inserted in face of mine tunnel, support 5x7-in. timber crossbars at Consolidated Coal Co., cutting timbering costs and speeding operation. Jacks, 36 in. long, have 12-in. sliding handles and ball-and-socket-type heads, permitting toeing-in of jacks. Jack body is 2-in. dia. steel pipe. Y-shaped jack end rests on 1⅛-in. dia. steel pin, inserted in 15-in. hole drilled in face by drilling crew. Pins are spaced 4 ft. on centers. Jacks, resting 2 ft. above floor, will support approximately 8 tons.

Two-foot clearance eliminates danger of knocking out vertical supports with cleaning equipment, speeds loading, increases clean-up efficiency. —COAL AGE

WAREHOUSE TRAINS MAKE UP GROCERY ORDERS EFFICIENTLY

Using a flexible low-cost system, a large National Tea Co. warehouse assembles 1,200,000 lb. of grocery orders a day for delivery to Chicago stores. A fleet of 49 electric industrial tractors pull trains of three or four hand-truck trailers through the aisles of a 50,000-sq.-ft. order-picking space, and the goods are taken from stacks and loaded on the trucks.

The tractor train is operated by a checker, who drives the tractor, and two pickers, one on each side of the train. As the train proceeds, the checker calls off the items by number, and the pickers take them from the stacks and put them onto the trailers. —FOOD INDUSTRIES

SKI TOW LIFTS MINERS

Tired miners at the Jones & Laughlin Steel Corp. Vesta-Shannopin coal mine are pulled up the inclined path from the mine entrance to the parking area by an endless cable, much as skiers are pulled up slopes at ski resorts. —COAL AGE

DESCENDING FLOOR FORMS CUT BUILDING COSTS

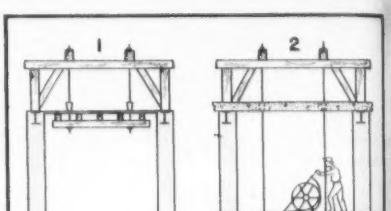
By starting at the top and working down in the concreting of floors of a multiple story steel-frame structure, savings up to 20% in slab costs, 66% in construction time, have been effected. Developed by Manuel Gonzales, Mexico City civil engineer, the system uses descending slab forms suspended by steel rods. The forms are stripped and reerected by slacking off the suspending rods and lowering the panel one story, a procedure so simple that for 10,000 sq. ft. of floor slab, only 6-8 hr. elapses between the start of the stripping operation and completion of the next form.

The slab form is constructed as for a normal wall panel, with sheeting in studs supported by walers. For top stories, the rods suspend the form from framework bridging between roof beams. For lower stories, doubled timbers on previously poured floor slabs anchor the rods. Chain hoists lower the form. Cones around anchor rods prevent them from "freezing" in concrete.—CONSTRUCTION METHODS

NEW FOOD, NEW PROCESS

Grapefruit in a new, lower cost form, Juicells, is canned by Bruce's Juices. In a patented process, the fruit is conveyed under steam and water sprays, through a tank of near-boiling water, and elevated to a coring machine. A worker halves the cored fruit, turns the halves inside out and shakes out seeds. Pulp is scraped from peel by corrosion-resistant wire loops on a wheel rotating at 250 ft. a min.

The pulp cells are retained on a stainless steel screen, while juice drains away. Any seeds and pieces of rag are removed on inspection table. Juice is sweetened and mixed with pulp, then pumped through a flash pasteurizer to can filler. Production cost is below that for grapefruit segments, and fruit need not be graded for size or variety, which reduces process costs. —FOOD INDUSTRIES



Top floors are poured first in the efficient new descending form procedure used in constructing tall buildings.

BACTERIA MAKE OIL

Dr. Claude ZoBell, University of California microbiologist, has discovered a microorganism — *Desulfavibrio halohydrocarbonoclasticus*—that aids escape of oil from underground formations, modifies the chemical composition of the oil deposits, and is believed to speed the evolution of organic materials into oil. In helping oil to escape, the microorganism: produces an organic acid that dissolves limestone, enlarging oil flow channels; multiplies so fast that it "pushes" oil out of rock; produces detergents that wash oil off rock; and produces CO_2 which decreases viscosity of oil.

Dr. ZoBell believes the organism may be used to free oil in wells where sands and shales are too tight to permit recovery or where pumping or repressurizing will not free oil. —BUSINESS WEEK

STEAM-HYDRO ECONOMY

With ample steam capacity, hydroelectric plants can be operated to produce maximum energy each year without fear of a power shortage in a low-water period. Moreover, the steam plant can be operated at minimum capacity if there is no need to store water, with saving in fuel. This relation between steam and hydro makes it economical to install more steam capacity than otherwise would be justified, as has been done by Nova Scotia Light & Power Co.—POWER

World-Wide Avigation Plan

As aid to airways, use of new radio and radar devices proposed; will be mandatory if accepted. Instrument landing, loran, Gee, radar included

Recommendations for a standardized international system of air navigation have been made to the Provisional International Aviation Organization by a special division, and these will become mandatory if adopted. To solve the pressing problem of landing during poor visibility, it is recommended that the instrument landing system (ILS) be installed at all international airports as soon as possible, certainly not later than Jan. 1, 1951. The chosen system includes a localizer, a glide path, and marker beacons. Principal advantage is that a single aircraft receiver and indicator is used both for landing and short-range navigation. To give the pilot a continuous indication of distance from the touchdown point, it was recommended that, by 1952, the markers be supplemented by a short-range beacon to furnish this information to aircraft having radar distance-measuring equipment (DME).

In short-range navigation, where high accuracy is required for precise traffic control, the very-high-frequency omnidirectional radio range, used with a DME beacon on the same site, is recommended. This presents position information in the form of azimuth and range, and is known as an R-θ system. In Europe a regional conference will consider whether the R-θ facilities at terminals of long-distance routes should be supplemented by the British-sponsored Gee system. Chains of Gee stations already cover most of western Europe with a lattice of hyperbolic position lines, provided as in loran, but with vhf transmission.

For long-range navigation, loran is recognized as already providing sufficiently important coverage over certain vital areas to warrant additional installations as the demand arises. Full transoceanic coverage is not feasible with the present 2-mc. frequency band, but a frequency of 180 kc. is expected to provide the required reliable range of 1,500 miles, at some sacrifice in accuracy. Trial installations are proposed.

With improvements in landing aids, a new bottleneck is expected in traffic control on the airport. A promising solution is the development of high-resolution surveillance radar, also discussed for use in air-traffic control. The desirability of pre-

TALKS PLANES DOWN—Radar impulses, sent out by unmanned radar trucks along runways, are carried through coaxial cables to Ground Control Approach console in airport control tower. Cathode ray screen (right) shows planes within 30 miles of field. Anzel three-dimensional scope (left) shows plane's position in relation to runway. By means of scope, operator can "talk down" plane. Economical one-man units will be installed at New York, Chicago, and Washington airports. —AVIATION NEWS

senting the same type of traffic picture to ground controller and pilot is stressed. Precision-approach radar of type used in GCA (ground controlled approach) is advocated to monitor and possibly supplement instrument landing facilities.

The other half of the air traffic control problem is seen to lie in improving short-distance ground-air communications; some form of visual presentation, independent of language, is advocated. For long-distance communication, two-way radiotelephony with aircraft is seen as a requirement to replace the present code transmissions.

Periodic transmission of weather maps by radio facsimile may ultimately improve the new long-range navigational technique, pressure-pattern flight. This usually involves flying along an isobaric track and takes full advantage of the winds. Change in pressure is detected by comparing the readings of barometric and radio altimeters. —ELECTRONICS

POWER-PLANT PACKAGE

Developed for war-devastated areas by Westinghouse Electric Corp., a completely equipped 5,000-kw. power plant includes a 75,000-lb.-per-hr., 450-psi. 760°F. steam generator; a 6,250-kw., 3,600-rpm. turbine-generator; duplicate boiler-feed pumps, wiring, piping, and other essentials for plants.

The coal-fired type employs a spreader stoker with traveling grate and economizer for stated 83% boiler efficiency. Oil-burning installation has an air preheater, develops 85% efficiency. —POWER

SULPHITE IN STEEL IMPROVES MACHINABILITY

Introduction of the sodium sulphite treatment of alloy steels is having a far-reaching effect. It increases machinability about 25% and tool life possibly more because of the absence of hard inclusions and because of the sulphur itself.

When added to molten steel, sodium sulphite forms sodium oxide and sulphur dioxide. The latter is retained in the steel as manganese sulphide while the sodium oxide fluxes high melting-point nonmetallics out of the bath to produce a cleaner steel. The treatment adds 0.02 to 0.03% sulphur that, together with normal residual sulphur, produces a steel of about 0.045 to 0.05% sulphur. This is about the upper limit for non-resulphurized steels.

Repeated tests have shown no difference between the physical properties of sulphite-treated steels and those of non-resulphurized steels, probably because of the high manganese-sulphur ratio (0.75-1.00% Mn to 0.05% S).—PRODUCT ENGG.

INDIA PLANS EXPANSION

Industrial and agricultural expansion in India, under both governmental and private control, is underway but will await settlement of political unrest before it reaches its peak. Nationalistic policy indicates a tightly regulated import-export market; protective tariffs already have been promised.

Steel output is scheduled for a 1,000,000-ton-per-year expansion. Plans for

HEAVY HAULER – Steel pipes, 30 ft. long, 70 in. I.D., were carried from fabrication point to site of the aqueduct on trailer-truck equipped with cable-operated monorail to. Small power winch lifts pipe and pulls it into padded cradles. Steel pipe liners were covered with 3/4-in. air-applied concrete. —ENGG. NEWS-RECORD

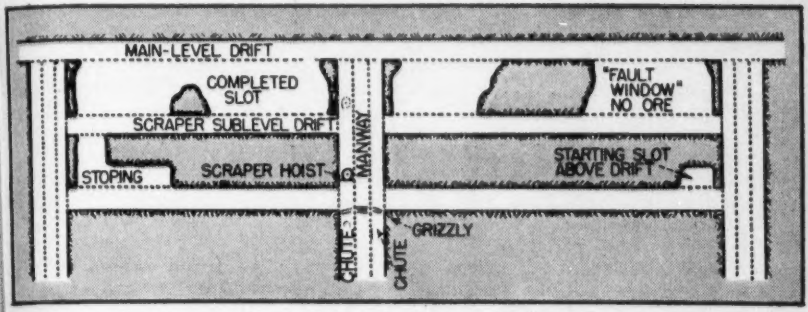


Diagram showing application of new scraper-slot excavating method, developed for working steep, narrow veins.

two industrial equipment plants, an electric lamp factory, engine factory, and rayon plant have been announced. Fertilizer output and farm machinery will increase. —BUSINESS WEEK

Three hydroelectric power systems will be constructed to augment power and land irrigation in the provinces north and west of Calcutta. A seven-dam, 200,000-kw. system, will be built on the Damodar River at the Bengal-Bihar border; three dams are under construction. A three-dam system will be built on the Kusi River in Nepal Province and a similar system on the Mahanadi River to serve Orissa Province. Work has been started on the Damodar project only. The program will cost an estimated $375,000,000. —ENGRG. NEWS-RECORD

ALL WHEELS OF LIGHT CAR SPRUNG INDEPENDENTLY

All four wheels are independently suspended on the new Willys-Overland 6-70 sedan. Front suspension is a transverse semi-elliptic, Dow-type spring bolted to a cross-member of the tubular frame under center of engine and to lower end of steering knuckle support.

At rear, the differential is bolted to frame by three studs and cushioned with rubber mountings. On either side of the differential a swinging-type rear axle extends from a ball-joint mounting. Longitudinal, semi-elliptic Dow-type springs hold axle housing. —PRODUCT ENGRG.

NEW MINING METHOD

Developed to facilitate mining of ore from steep, narrow veins, the new scraper-slot stoping (or excavating) technique now is being used for wider veins. Advantages are: (1) Clean ore. (2) Steady production for the mill. (3) High labor efficiency—10 tons per man-shift while drifting, more from the slots. (4) Little timbering and no expense for cleaning down afterwards. (5) Safe, convenient, and well-ventilated working places. (6) Flexibility in working irregular and branching veins and isolated areas between levels.

With scraper-slot method, stoping proceeds from top of block downward, and two adjoining stope blocks are worked jointly from dividing raise. Stoping starts with drawing down broken ore in middle raise to point 25 ft. down the dip, and starting first sublevel as two opposite horizontal drifts. Broken ore from these drifts is scraped into central chutes, and drifts are driven without flooring or track. Second step in stoping is to break out panel of ore over sublevel drift and up to floor of main level overhead. Third stoping operation is to scrape ore broken from slot into central raise. Then a long round timber is rolled over narrow top of empty slot.

Second sublevel is started in same manner as first. —ENGRG. & MINING JOURNAL

Freezing Becomes Big Business

Frozen foods gain general public acceptance. Processing problems solved, but better distribution facilities needed. Locker plants increase fast

Frozen food processing and quality control problems have been solved in the U. S., and the products have achieved general public acceptance. Production doubled between 1942 and 1945, and is increasing at a rate which threatens to outstrip distribution facilities. Output in 1945 was (millions of pounds): fruits and vegetables, 738; seafoods, 286; eviscerated poultry, 113; eggs, 375; cooked foods, 35; meat (1944 figure) 6,111.

More low-temperature facilities are needed in storage warehouses and in transportation. Frozen foods must be kept in freezer storage, and the availability of freezer space governs all wholesale distribution plans and retail marketing operations. Conditions of transport and storage have much more to do with the retention of desirable food properties than quick freezing, important though it is. Color, textures, flavor, and appearance can be damaged easily by failure to maintain continuously low temperatures.

Improvements are being made in refrigerated railway cars, and the heavily insulated, overhead-brine-tank car appears the most suitable so far for frozen foods. It holds the foods at a 15°F. average temperature.

Refrigerated ships are being built with facilities for frozen food storage, but none maintain less than 10°F., and this may not be attained in tropical waters.

To store frozen foods in public warehouses costs about ¾¢ per lb. per month. But one large distributor operates his own warehouse at a cost of 0.4¢ a lb. per year. Another estimates private warehousing at 0.2¢ a lb. per month.

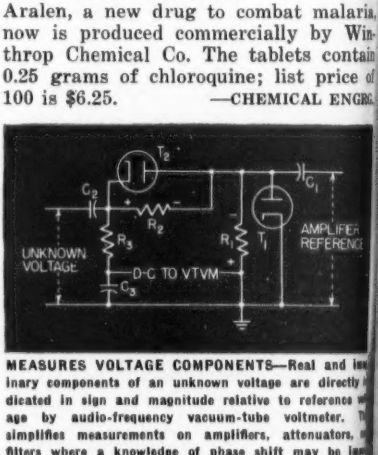
Freezer locker plants—which rent refrigerated space to individuals—are in a natural position to handle commercially packed frozen foods. But the larger locker plants will, in producing regions, become competitors of the commercial packers. The locker business is growing rapidly. There are an estimated 8,025 plants, with 3,250,000 lockers, which store almost 1,250,000,000 lb. of food annually for some 2,250,000 families, 75% of whom are farmers.

Locker plants range in type from those that rent space only to those that give various services to patrons, such as preparing and packaging the food for freezing, butchering, curing, and operation of chill rooms.

Locally grown meats and poultry are, by far, the items stored in largest quantity. The rapid expansion of locker plants is opening a new field for food merchandising. —FOOD INDUSTRIES

NEW ANTIMALARIAL

Aralen, a new drug to combat malaria, now is produced commercially by Winthrop Chemical Co. The tablets contain 0.25 grams of chloroquine; list price of 100 is $6.25. —CHEMICAL ENGR.



MEASURES VOLTAGE COMPONENTS—Real and imaginary components of an unknown voltage are directly indicated in sign and magnitude relative to reference voltage by audio-frequency vacuum-tube voltmeter. This simplifies measurements on amplifiers, attenuators, filters where a knowledge of phase shift may be important, and it fills a long-standing need. Reference and unknown voltages are rectified and combined. Combination is effectively the algebraic sum of reference and in-phase component of unknown voltage.—ELECTRONICS

ALUMINUM HOUSE—Two unskilled workmen can erect this $899.75 all-aluminum, prefabricated, 4-room house. Side walls are assembled on ground, raised by hand, and bolted together. Package includes: exterior walls, interlocking roof sheets, interior partition framing, exterior sash and trim, plus necessary nuts and bolts. Purchaser must provide: foundation, flooring, windows, doors, interior wall finish, wiring, and plumbing. —FACTORY

TESTER FOR HIGH-POWER ELECTRONIC TUBES

To test high-power electronic tubes, a new technique has been developed. A motor-driven 5-rpm. commutator alternately operates a trigger circuit and a calibrating circuit. The trigger circuit fires an ignitron tube to apply a high-voltage pulse to grid of tube being tested. The grid current deflects a cathode-ray oscilloscope beam horizontally, and the plate voltage, plate current, or grid voltage, as desired, deflects the beam vertically. The end of the resulting characteristic curve, as seen on the long-persistence screen of the oscilloscope, then is matched with a calibrating spot to obtain a reading of peak values. The spot appears on the oscilloscope screen when the commutator operates the calibrating circuit. —ELECTRONICS

24 O'CLOCK TIMETABLES

North Coast Transportation Co. is experimenting with around-the-clock system of listing arrival and departure time on bus schedules. Hours will be numbered from 1 to 24—midnight being 2400, 1 a.m. being 0100. Such 24-hour numbering will eliminate the need for a.m. and p.m. appearing in the schedule, eliminate punctuation in times, and lessen danger of confusion on the part of the passenger. To aid patrons in orienting themselves to the new system, NTC's first 24-hour schedule will carry standard time designations along with the 24-hour system. —BUS TRANSPORTATION

ON-WHEEL STORAGE PAYS

Cost of handling raw lumber entering the White Sewing Machine Corp. plant has been reduced from $8.44 to $2 per 1,000 bd. ft. by storing lumber on wheels. Only one handling is now necessary between boxcar and first planing operation instead of six previously. Cars have four 2-wheel metal buggies connected by six strips. Cars will accommodate 7,000 bd. ft. of lumber. —FACTORY

KEY TO LABOR MONOPOLY

Key to the monopoly control exercised by some segments of labor is the closed shop, a shop in which the worker must make his peace with a union in order to have a job. Arrangements which make good standing in a union a condition to holding a job raise serious issues about the individual's basic right to work. They also lie at the root of the dominant economic power now exercised by some labor leaders. The problem of reducing the power of these labor leaders to proportions that make it safe for democracy is the age-old problem of monopoly.—*From an editorial by James H. McGraw, Jr., in all McGraw-Hill publications.*

TECHNICAL SHORTS

Easy-rolling Freight Cars—Chesapeake & Ohio Railroad is planning to purchase 1,000 freight cars equipped with roller bearings, replacing conventional friction bearings. Results expected: easier starting, heavier train loads, higher speeds. —BUSINESS WEEK

Underwing Plane Refueling—Underwing refueling has proved practical on Martin 202 planes with a special pump truck. Method is 3 to 4 times faster than above-wing refueling, is safer, more convenient, and more economical. —AVIATION NEWS

Chain Curtain Protects Worker—Operator of a high-speed face milling machine at Carboloy Co. is protected from flying chips by a curtain of overlapping sash chain lengths suspended from a steel ring. Curtain encircles cutter, so bracket supports are designed for quick removal and replacement by setup man. —AMERICAN MACHINIST

Concrete Louvers Cut Sun Glare—Lightweight vertical concrete louvers, 2x6-ft.x1¾-in., on west wall of the new Chevrolet assembly plant in California, provide adequate light and ventilation but exclude direct glare and heat of sun. Louvers are precast in steel forms, placed by block and tackle. —ENGRG. NEWS-RECORD

Polydichlorostyrene Explained—It absorbs less water than any other thermoplastic (0.02%), can be maintained at 220°F. without dimensional change or appreciable loss in strength. Power factor is 0.0003 to 0.0008 between 1,000 and 1,000,000 cycles; dielectric constant, 2.64 to 2.66; Rockwell M hardness, 95. The new Mathieson Alkali Works plastic is resistant to acids and alkalis at elevated temperatures. —ELECTRICAL WORLD

Eliminates Shoveling—Coal spillage under plate feeder and apron conveyor is automatically reloaded on conveyor, eliminating hand shoveling, at Danreath Coal Co. A 6-ft. section of auger in 4-in. pipe moves spillage to outside, then a flight conveyor raises it to conveyor level. —COAL AGE

Broom Drag for Road Repair—Virginia State Highway Dept. used a broom-drag surface treatment to resurface a 3-lane highway, resulting in lower costs, speedier repair, and tighter surface than with previous seal-coat and stone-chip method. After asphalt was applied, a single pass was made with broom, followed by road planer. Rig, composed of six sets of steel bristle brushes, was made in shop. —ENGRG. NEWS-RECORD

Pictures Locate Conduit—To provide lasting information as to the exact location of conduits in building floor slabs, Boston Edison Co. photographs the layouts during construction. Wooden rails graduated in feet serve as scale coordinates to identify location after floor is completed. —ELECTRICAL WORLD

Handles 117-ft. Piles—To support 24x24-in. green concrete piles up to 117-ft. long while lifting them with a steam crane, a 73-lb. 14-in. steel H beam was used as a strongback by McLean Contracting Co. The beam was placed on top of horizontal pile and clamped to it at four points. Cable pickup from derrick to strongback was at four points through two free-running bridles hooked to a third free-running bridle handled by one of crane load lines. —CONSTRUCTION METHODS

Broaching Blind Hole—To broach a blind hole into which a full length broach cannot be inserted, design the tool in sections and use one section after the other. For high-speed production, mount the sections on an indexing table and push part over them in succession with a ram. —AMERICAN MACHINIST

GLASS AND PLASTIC—Aircraft parts illustrate adaptability of glass-fiber-reinforced plastic to fabrication of complex compound-curve parts. Small three-outlet duct on table (center) incorporates a flexible-coupling outlet and the rigid duct in an integral molded unit. Cockpit heat-control valves (two on table, one resting on the small box) have metal bearing inserts. Two-piece engine cowling for target plane is in foreground. Three other large units are header ducts. —PRODUCT ENGR.

Flashlight for Blind—With the visual aid developed by Joe Walker, a flashlight illuminates the scene and returning light beams are focused by a lens into a photoelectric cell. An oscillator or motor-driven fan modulates the beam, and change in audio tone is heard from earphones or built-in loudspeaker. —ELECTRONICS

Unnecessary Handling Costs—Nonstandard packaging greatly increases handling cost, according to Republic Steel Corp. officials. On 800 orders totaling 250,000 tons, nonstandard packaging increased one company's costs 21 to 54c. per ton, a monthly increase of $50,000. Another company has cut shipping and handling costs 32% in 20 years, in spite of a 119% jump in labor cost.—BUSINESS WEEK

Hillside Garage—Utilization of hill slope made use of mechanical lifts unnecessary in a 736-car garage in Melbourne, Australia. Entry to each of the seven steel and concrete decks is from ground level, decks being open at sides and ends. Decks accommodate from 28 to 164 vehicles. —ENGRG. NEWS-RECORD

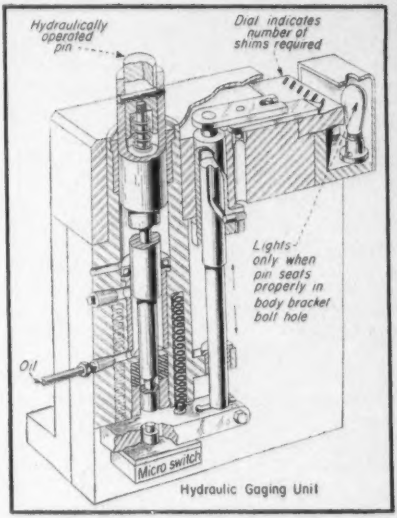
To Raise Conductor Ratings—Safe ratings of open-wire, overhead power conductors are restricted in many cases to values well below the capability of the conductors by joints and conductor-supporting hardware. If greater capabilities are required, it appears practical to replace all splices and many connectors with compression splices.—ELECTRICAL WORLD

Speeds Maintenance—Signode Steel Strapping Co. maintenance department has designed a job assignment board to show location of workmen and work order numbers on which they are working. Board has resulted in faster work, higher average performance. It also facilitates locating workmen when emergency work arises. Worker is responsible for taking and replacing work order number opposite his name. —FACTORY

Finds Lost Torpedoes—A way to locate torpedoes lost during test runs has been developed at Harvard. A supersonic transmitter installed in the torpedo produces a 24.5-kc. sound wave that is picked up by a directional magnetostriction hydrophone in a search vessel. Diver with portable hydrophone finds torpedo's exact location. —ELECTRONICS

Airport Rents Autos—Grand Central Airport, Glendale, Calif., will use four Crosley cars to provide transportation for transient plane owners who have business off the port. Rental rate will include insurance. —AVIATION NEWS

Increase Slasher Production—Slasher production can be increased 6-10% by converting a spinning frame to a twister and eliminating the selvage creel racks on the slasher. Slashing 20's to 25's in sets of 3,000 ends, one mill eliminated creeling spooler cheeses behind slasher to form selvages. —TEXTILE WORLD


Hydraulically operated pin
Dial indicates number of shims required
Lights only when pin seats properly in body bracket bolt hole
Oil
Micro switch
Hydraulic Gaging Unit

SAVES ASSEMBLY TIME—Hydraulic gages check bracket bolt holes on Buick automobile frames to avoid assembly-line delay. Twenty-five gages are mounted in a fixture base of structural shapes. Frame is placed bottom-up in fixture and locked by dowel pins. Hydraulic pressure advances plunger in each gage, moving pin into bolt hole in each properly aligned bracket. Plunger at base of hydraulic cylinder operates Micro switch to light "OK" lamp and moves lever that actuates pointer to show number of 1/16-in. shims needed to correct bracket height (number is indicated on frame by punch marks). When light does not go on, bracket is aligned by hammer blows. —PRODUCT ENGRG.

Lightplane Water Injector—Tests run on the new Longren Aircraft Co. water injector for lightplanes indicates a 10% increase in hp., fuel reduction of 1 gal. per hr., and lowering of cylinder-head temperature 20°F. with 1 qt. of water per hr., 75°F. with 3 qt. Inventor claims sludge and carbon deposits are reduced, and 73 octane gas can be substituted for 80 octane. Water is injected as spray at junction of the carburetor and the fuel-intake manifold. —AVIATION NEWS

Deep-drawing Timesaver — Air-operated sprayers save much time in applying drawing compound to metal before deep drawing in the Fisher Body plant. —AMERICAN MACHINIST

For Flying Fishermen—To spot schools of fish, a 115-ft. tuna clipper will carry a pontoon-fitted Luscomb monoplane. Hoist raises and lowers plane over the side.-BUSINESS WEEK

Mining Methods Improved

Rising costs force operators to adopt better techniques and labor-saving machinery. Coal Mining Institute recommends new equipment

Faced with a rise in machinery investment—from $1.50 per ton of annual output to between $3 and $4 per ton in the past 25 years—and with the possibility that coal may be replaced by other competitive fuels, the Coal Mining Institute is pressing for more efficient mining methods and wider use of labor-saving machinery.

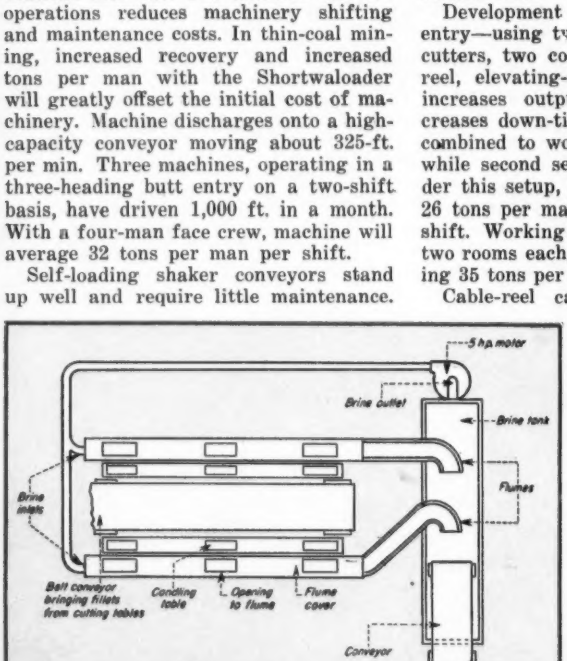
For more efficient thin-coal mining CMI recommends the Shortwaloader, which combines cutting and loading operations into one. One machine for two operations reduces machinery shifting and maintenance costs. In thin-coal mining, increased recovery and increased tons per man with the Shortwaloader will greatly offset the initial cost of machinery. Machine discharges onto a high-capacity conveyor moving about 325-ft. per min. Three machines, operating in a three-heading butt entry on a two-shift basis, have driven 1,000 ft. in a month. With a four-man face crew, machine will average 32 tons per man per shift.

Self-loading shaker conveyors stand up well and require little maintenance. One shaker conveyor, discharging onto a butt belt, can drive three butt headings and produce about 150 tons per day with eight face men. Duckbills, which cut across face under their own power, can produce between 30 and 40 tons per face man per shift.

In mines with bed thicknesses of 38 to 44 in., low-type, crawler-mounted loaders and high-capacity chain conveyors have proved satisfactory, as have higher capacity machines loading into 3-ton shuttle cars.

Development of a four-heading butt entry—using two loading machines, two cutters, two coal drills, and two cable-reel, elevating-discharge shuttle cars—increases output about 50% and decreases down-time, as two crews can be combined to work one set of machinery while second set undergoes repair. Under this setup, 11 to 12 cuts, with 22 to 26 tons per man, could be averaged per shift. Working back, two crews, working two rooms each, produce 22 cuts, averaging 35 tons per man per shift.

Cable-reel cars with elevating dis-



EFFICIENT BRINER — Simplified, sanitary apparatus for conveying, washing, brining, straining, and precooling foods for freezing is used at Gorton-Pew Fisheries. Fish fillets are inspected and dropped into flumes where they are vigorously tumbled and washed by high-velocity brine. Brine and fillets discharge from flumes into tank and flow to elevating conveyor at end. Baffle separates incoming brine from that in lower part of tank. Ramp near top of brine prevents fillets from sinking. Modified briner, without flumes, recirculates brine from tank bottom through sprays located above ramp. —FOOD INDUSTRIES

charge are believed preferable to battery-powered cars, since they eliminate about 25% of the hauling distance by dumping onto belt at room mouth. Charging stations may be eliminated, saving from ½ to 1 man per shift.

By keeping crews small, the foreman can keep better track of the per-man production, even though he handles two or more crews, than if the crews are large. This becomes increasingly important as labor costs rise. —COAL AGE

GRAPHITE HEAT EXCHANGERS NOW WIDELY USED

Heat exchangers made of impervious carbon or graphite have become widely used in the chemical industry. This equipment is resistant to most acids, alkalis, and other corrosive solvent or reducing agents. It is not subject to corrosive scaling to any appreciable extent, and such scale as does occur usually can be removed by means of a solvent. A wide range of thermal conductivity is available; carbon is a fairly good insulator, but stock made from graphite is higher in thermal conductivity than most metals —three times as high as carbon steel.

A low coefficient of expansion gives exceptional resistance to thermal shock. Good mechanical strength and easy machinability adapt the material to headers, manifolds, tube sheets, domes, return bends, baffles, towers, pumps, pipes, valves, and other parts.

To make the carbon and graphite impervious, impregnation is effected with three standard resin formulas—phenolic, modified phenolic, or furfural base. The resins are cured in the pores of the stock after manufacture. —CHEMICAL ENGRG.

DISPOSABLE ICEBOX

Cardboard containers, 14x14x26-in., lined with blanket insulation, and containing a 6x6x12-in. controllable refrigeration unit, will maintain inside temperatures between 50 and —20°F. Dry ice is stored in a honeycomb-paperboard-lined metal can, housed in a paperboard container.

DESIGNED FOR SAFETY—Low center of gravity in this 1947 Studebaker Champion permits car to tilt to an angle of more than two-thirds off horizontal without going over. Mechanic holds car at its center of balance to demonstrate stability. —AMERICAN MACHINIST

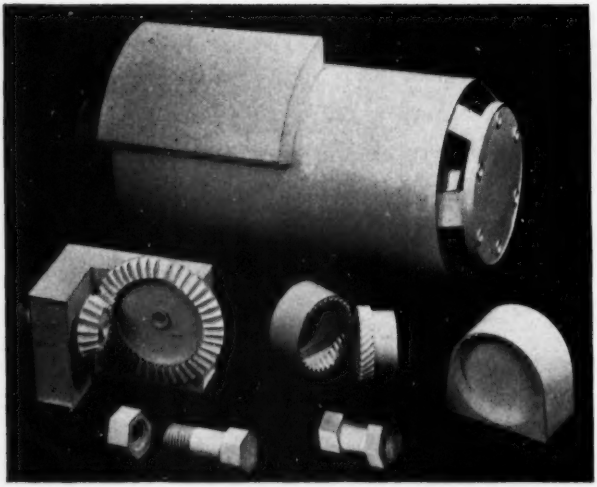
Rubber exhaust tube runs from can to outside, carrying off CO_2 gas. Temperature is controlled by regulating CO_2 pressure inside can. If inside temperature of container rises, control valve on exhaust opens, allowing dry ice to evaporate more rapidly. Container, with dry ice, costs $2.30; without ice its weight is 8 lb. —BUSINESS WEEK

ROTATIVE AIRPLANE BRAKE

Ground tested at 80 mph., a variable-pitch, autorotative tail-mounted flight brake, resembling a small propeller, is proposed by a Southwest Airways executive as the best way to lower landing speed. Such a rotor has 1.5 times the drag of a plate with area equal to that of rotor's disk. On a 3,000-lb. craft a 4-ft., 10-12-lb. rotor would steepen glide from 12:1 to 6:1. —AVIATION

AMINES STOP CORROSION

Troublesome corrosion of boiler feed pumps, deaerating trays, and heaters in a Southwestern Gas & Electric Co. plant has been stopped by adding to the water 1½ to 2½ ppm. of a volatile organic amine to hold the pH between 7.4 and 8.0. This nitrogenous substance probably has an additional inhibiting effect because it forms a monomolecular film by absorption on a metal surface. —POWER



CARDBOARD DESIGN — Cardboard drastically reduces the cost of materials and time involved in the use of mock-ups as aids in product design. Objects can be mocked-up initially in the drafting office, and revisions made without time loss involved in outside pattern work. Cardboard mock-ups are light, but are rigid and strong, and can be produced in virtually any size. Box shapes, tubes, cylinders, plates, and cones of cardboard readily can be fashioned into gears, wheels, splined fittings, roller bearing, nuts, and bolts, whirl work. —PRODUCT ENGRG.

MATERIALS HANDLING COSTLY IN COTTON MILLS

Analysis of actual and estimated costs of operating a 40,000-spindle cotton mill during a 120-hr. week showed motion-and-time study men that intra-process materials handling cost operators about $10,000 per week, or about 70% of the process cost. Semimechanized handling in spooling, warping, and slashing operations has lowered handling costs, and it is suggested that similar applications in warehouse, card, spinning, weave, and cloth rooms would effect similar savings.

Warehouse costs in the plant studied were estimated at $494 per week, but they are believed to be much higher. Use of overhead hoists, conveyors, and lift trucks are advocated for use between warehouse and opener rooms. Location of scales and receiving equipment should be studied in receiving rooms, as handling costs here often equal those in the warehouse.

By locating the spinning room a floor above the weaving room, metal or hardwood chutes can transport filling yarns to weave room. Empty quills can be returned by conveyor belt, attached to a quill-cleaning machine.

Wherever possible, dumping of materials should be avoided. Doff boxes of warp yarn can be slid onto yard trucks and moved to spooler room for direct feeding to spooler machines, eliminating two dumping operations.—TEXTILE WORLD

PROFITABLE RESEARCH

Engineering research will pay handsome dividends to a manufacturer. It should be distinctly different from industrial and pure research and be conducted by men of different temperament and mentality. The applied research worker must have experience, good judgment, and common sense, as well as imagination.

Engineering research has three functions: (1) service to other departments; (2) continuous development of new methods, materials, or processes; (3) research with or leading to development. The second brings big returns.

In a small enterprise, one man may be assigned to engineering research, his equipment being a slide rule and engineering handbooks, his laboratory the factory itself. —CHEMICAL ENGRG.

CHEAP OXYGEN LIKELY; WILL IMPROVE PROCESSES

Low-cost oxygen—which has important advantages in the process industries—is in prospect. A low-purity oxygen likely will be produced at a small fraction of present cost of high-purity gas. For a plant designed for a 48,000,000 cu. ft. per day capacity, estimated cost is 4.8c. per 1,000 cu. ft. of 95% O_2. Other estimates range from 10 to 18c.

Cheap oxygen would permit high-capacity continuous operation of the water gas reaction. It may allow complete gasification of coal, with savings in investment and operating costs. In the steel industry, an oxygen-enriched blast may shorten the cycle of the open hearth furnace, improve the Bessemer converter cycle, and give better blast furnace economy—even permit direct production of steel. Chemical manufacturers may use cheap oxygen in the production of synthesis gases for a wide variety of synthetic organic products, including liquid fuels.

Of the various processes for producing oxygen, those depending upon liquefaction and subsequent fractionation are the ones on which the great bulk of oxygen production will depend.

Germany advantageously used low-cost, low-purity oxygen made by the Linde-Fränkl process. This process utilizes two pairs of metal regenerators, or "cold accumulators." A pair of the metal-packed accumulators is cooled by the leaving streams of oxygen and nitrogen, then air is passed through them. Water vapor and carbon dioxide are frozen out, then reevaporated in the next cycle of operation. —CHEMICAL ENGRG.

GUN KEEPS KILN OPERATING

Slugs fired at 1,600 fps. from an industrial gun break the clinker rings which form about 30 ft. from end of cement kilns. Instead of shutting down and cooling the kiln so men can climb inside to break ring with hydraulic pressure, a few shots are fired from outside the kiln to knock out an archway. Then ring tumbles of its own weight. Remington Arms Co. developed the gun for industrial purposes. —PRODUCT ENGRG.

CAPONIZED BY CHEMISTRY

Chickens can be safely and easily caponized by feeding them synthetic female hormones—diansyl hexane or diethyl stilbestral—General Mills reports. After such treatment, the cock loses his comb and strut, grows to 6 to 10 lb. The meat has been eaten with no ill effects, but the liver, the gizzard, and the heart are discarded. —BUSINESS WEEK

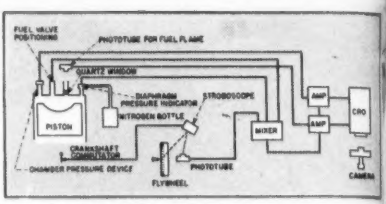
REPLACES 3 DRAGLINES—With a 200-ft. boom and a 22-yd. bucket, this walking dragline employed at a Philadelphia & Reading Coal & Iron Co. strip mine will replace three smaller units. It is equipped with Amplidyne control on all movements—drag, hoist, and swing—to give fast acceleration and deceleration and to lessen stress on pinions and front end. Working in all solid yardage, capacity is 600 cu. yd. per hr.; in recasting work, about 900 cu. yd. per hr. —COAL AGE

VESTIBULE SESSIONS CUT ON-JOB TRAINING TIME

By preceding on-the-job training with a concentrated 3-day vestibule training period, pointed to worker memory of nomenclature and assembly order, B. F. Goodrich Co. has cut learning time from 60 days to 10-15 days. Vestibule training is prefaced by a 15-min. discussion on safety and departmental policy by the shift foremen. Then the floor foreman takes over. Memory is stressed through vivid impression, association, and recall and repetition. Basic understanding of parts to be made, and of function of those parts in the whole, is provided by charts, films, and use. Trainees are conducted through the plant to see operations previously discussed. —FACTORY

PROGRESS IN PLASTICS

Intricate prisms and lenses can be mass-produced from polycyclohexyl methacrylate and polystyrene, eliminating the laborious hand methods. The former has a refractory index similar to that of crown glass and can be accurately cast. It softens at 70°C., scratches relatively easily. Styrene, used in combination with polycyclohexyl methacrylate parts, produces achromatic systems superior to those designed from glass combinations. . . . Phenolic resins now are blended with synthetic rubbers to form adhesives of exceptional quality for bonding similar or dissimilar materials, especially where moisture is prevalent. . . . Injection molding now is used to produce exceptionally large, high-quality, accurate, hard rubber pieces as result of new press equipment. —PRODUCT ENGRG.



ELECTRONIC ENGINE TESTER—For economical and accurate recording of data involving simultaneous observation of several phenomena in diesel fuel testing, Caterpillar Tractor Co. uses this electronic setup. Fuel-valve position is converted to a variable voltage, as is pressure. Fuel flame and crankshaft position are viewed by phototubes. Resultant signals are fed into a mixer and amplifiers to a dual-gun cathode ray oscilloscope. A high-speed camera records the curves. —ELECTRONICS

HELICOPTER AIRMAIL

U. S. Post Office Dept. instituted experimentally five helicopter airmail routes recently between New York City and 39 communities in New York and New Jersey, all within a 50-mile radius of the city. Nine Firestone XR-9B helicopters were used on the routes. From 6-12 hr. is saved. Regular service is expected by mid-1947. —AVIATION NEWS

LABOR SAVING AT FORD—Sheet metal for car body sections at Ford Motor Co. moves from coils of strip through feeding mechanism, press, conveyor, and automatic ejector mechanism to straightening rolls without manual labor. Rate of coil unwind is synchronized with speed of press. After punching, blank is picked up by suction cups on male die, as ram goes up. It is dropped over moving rack and carried to straightening rolls by conveyor. —BUSINESS WEEK

Evaluate Your Merchandise

Point system, based on profits, inventory turnover, dollar value, and warehouse space and labor, will pay distributor dividends; cuts waste effort

Cost-analysis systems, having proved of value to manufacturers, are being put in operation by distributors to check the value of the various items of merchandise handled. Item costs to distributors usually are indirect and difficult to establish for an individual item. The allocation of cost to an item will not remain constant throughout the industry. Where cost of delivery is high or where salesmen are paid a fixed percentage of the gross profit rather than a percentage of their sales, systems will have to be manipulated to suit the individual need. Expenses of storage, handling, delivery, paper work, sales, and promotion also will vary. Each distributor must tailor-make the system to suit his situation.

Henry G. Thompson & Son Co. suggests a point system of product evaluation, based on gross profit, average yearly inventory turnover, average dollar value per invoice line, cost of warehouse labor, and cubic feet of warehouse space occupied. The table of points (shown below in part) was based upon an analysis of statistics from nine large distributors.

Since the average yearly inventory turnover most directly affects profits, points for turnover were placed high. The other four factors were evaluated accordingly. Breakdown of factors should be made as follows:

Gross profit percentage: This is the average gross profit for the product.

Average yearly inventory turnover: Find the number of times the average inventory will be sold in the year by dividing the cost of goods sold by the average inventory.

Average dollar value per line: Divide the total sales of one line by the number of invoice items.

Warehouse labor per $100 of sales: Labor hours must be converted into dollar values and divided by the sales.

Warehouse space per $100 inventory: Cubic feet of warehouse space is divided by the average product inventory.

All figures are plotted to the nearest whole number. Comparing items may easily prove that those items yielding a high gross profit, when weighted for the other four factors, are in reality less profitable than an item giving a lower gross profit with higher turnover and higher dollar value.

Application of the point system of cost analysis will enable the distributor to employ sounder management policies, thus eliminating some waste effort and cost in misdirected merchandise and sales promotion.

—MILL SUPPLIES

Gross profit		Average yearly inventory turnover		Average dollar value per invoice line		Warehouse labor		Warehouse space	
Percent	*Points*	*Number of times*	*Points*	*Dollars*	*Points*	*Labor required per $100 of sales*	*Points*	*Cubic ft. per $100 of inventory*	*Points*
1	1	½	4	$2.00	0	$.10	15	10	7
2	2	1	8	4.00	3	.20	14½	25	6½
3	3	1½	12	6.00	7½	.30	14	40	6
4	4	2	16	8.00	15	.40	13½	55	5½
5	5	2½	20	10.00	20	.50	13	70	5
6	6	3	24	11.00	30	.60	12½	100	4½
7	7	3½	28	12.00	40	.70	12	200	4
8	8	4	32	13.00	50	.80	11½	300	3½
9	9	4½	36	14.00	60	.90	11	400	3
10	10	5	40	15.00	70	1.00	10½	500	2½

NEW PRODUCTS

Slow-melting Ice—Introduction of an undisclosed chemical into ice during freezing process retards melting rate 37-40%, according to Zenith Processing Co. makers of the new TW-ice. Slow-melting ice will cost $2 a ton more than conventional ice, but shipments of vegetables have been made coast-to-coast without reicing. —BUSINESS WEEK

Fast Fabric Fastener—Made of clear Tenite II plastic, one strip of the new Boeing-designed fabric fastener is riveted to the plane structure. End of fabric is wound on second strip which snaps securely onto first, tightening fabric. Snap action permits fast, easy removal of fabric for repair. —AVIATION NEWS

Semi-automatic Lathe—Where full-automatic or multiple-spindle lathes prove too costly, the new single-spindle, hydraulic-feed, semi-automatic lathe designed by Oster Mfg. Co. may be used to increase production. Motor is 7½-hp.; a 2-hp. motor powers the hydraulic system. Automatic chuck is equipped with draw-back collet with adjustable work stop and spindle. —MILL SUPPLIES

Electrical Rust Preventer—By eliminating electrolytic action, a new Trimount Instrument Co. device prevents corrosion of metal. Flow of current in protected tank or pump is reversed by introducing a cathode which is charged by a rectifier. Then the tank or pump becomes the cathode instead of the anode and no longer is subject to corrosion or rusting. Submerged area of 10,000 sq. ft. is protected. —POWER

Direct-indirect Light Bulb—Both direct and indirect light are provided by the new 200-watt Bolite lamp bulb developed by Sylvania Electric Products Corp. Designed to burn base down, the bulb has a frosted flat top, or end, for upward diffusion, and has an opalescent coating on lower portion to diffuse the illumination which falls on the working surface. —ELECTRICAL WORLD

Plastic-lined Pipes—Corrosive-resistant steel pipes lined with phenolic plastic are being produced by National Supply Co. for use in oil-field equipment. Pipe is shot-blasted, then four coats of plastic applied, air dried and baked. —BUSINESS WEEK

Electrical Computer—Problems involving frequency, inductance, and capacity are solved quickly with the Calculaide computer of American Hydromath Co. It is a circular slide rule made of three graduated plastic sheets. —PRODUCT ENGRG.

NEW ENGINE DESIGN—This 1-cyl., 2-cycle, air-cooled, gasoline engine designed by McCulloch Motors Corp. uses reverse-flow scavenging, permitting flat-top, non-deflection pistons. At 2,500 rpm., motor develops 2.5 hp. Guide vanes in intake ports accurately control and focus incoming fuel, reducing hot-spot detonation. Die-cast aluminum alloy parts are used. Rope and high-tension magneto are used in starting. —ENGRG. NEWS-RECORD

Electric Heat Gun—Useful on cumbersome assemblies where many spot heats are required, the new Tocco Div. heat gun is a portable inductor with hand grip and trigger switch. It utilizes a multiple-turn coil to obtain high flux density, which permits long leads of moderate dimensions. The gun is used with a 10,000-cycle motor-generator induction heating unit. —AMERICAN MACHINIST

Lightning Arrestor Makes Gas—Hi-Stroke, a new, heavy-duty, expulsion-type lightning arrestor for 6- and 9-kv. rural power lines has been developed by General Electric Co. The internal gap is located in an interrupting chamber containing gas-evolving cellulose fiber spheres. A spring-actuated plunger pushes more spheres into the gap after the arrestor operates. —ELECTRICAL WORLD

Tests Spark Plugs—Plastic tube with internal neon light, which glows if auto engine spark-plugs are performing efficiently, checks plugs without removal. Tip of tester serves as a gap gage, cap as tire-valve adjuster. It is made by Littelfuse, Inc. —BUS TRANSPORTATION

Electric Truck Brake—Developed for heavy-duty vehicles, a new dual electrical braking system includes an electric retarder on truck drive shaft or live axle of trailer and electro magnetically operated shoe brakes on all wheels. Retarder functions as eddy-current brake to slow vehicle. For emergency stops, a Micro switch on brake pedal activates retarder to full capacity. Warner Electric Brake Co. makes it.—CONSTRUCTION METHODS

Stretchable Gear Drive—In the Gearmatic, a driven gear can be shifted toward or away from the driving gear. The two are "connected" by two floating pinion gears mounted on swinging arms so as to follow the movement and always remain meshed with the larger gears. It is a McNally-Pittsburgh Mfg. Corp. development. —PRODUCT ENGRG.

New Metallic Packing—Nonfrictional metallic foil is combined with asbestos yarn in a new flexible packing for steam and air rods, pump shafts, and valve stems where surface temperatures do not exceed 450°F. The new packing is a product of Raybestos-Manhattan, Inc. —ENGRG. & MINING JOURNAL

Air, Water Gun—Connected by standard fittings to air and water hoses, the new Turco Product Co. lightweight air and water gun is controlled by a finger-actuated lever, eliminating adjustment of valves. —MILL SUPPLIES

Electrocutes Roaches—Roaches are killed by charged metal wire bands surrounding bait in a 12x8x6-in. trap developed by Turner & Davis. A transformer steps up 110 volts to 250-550 volts; amperage is harmless to humans. —BUSINESS WEEK

6-in-one Tester—The new hand-size Polyvoltester indicates: (1) phase rotation, (2) ac. or dc., (3) positive or negative on dc. without going to ground, (4) 220 and 110 volts ac. or dc., and (5) will identify all wires in a 4-wire combination system as well as (6) locate blown fuses. The handy multipurpose tester is made by Robert C. Rindfleish & Associates. —ELECTRICAL WORLD

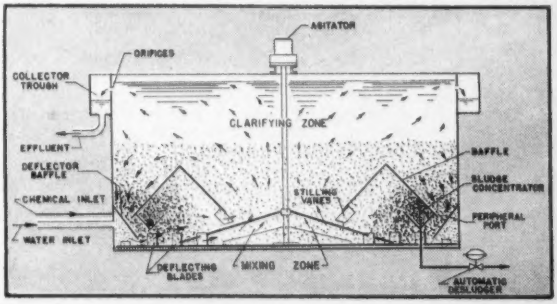
Ultrasonic Thickness Tester—Weighing only 14 lb. and powered by a dry battery, the portable ultrasonic Audigage conveniently measures thickness of metal or glass. A narrow sound beam is reflected from the far surface, and a direct-reading dial is adjusted until audio modulation of the ultrasonic oscillator sounds loudest in the headphones. Range, 0.09-4.0 in. of steel; accuracy, ±2%. Branson Instruments, Inc., developed the tester. —ELECTRONICS

For Air Shipment of Foods—Developed for air transport of perishables, a 4x4x4-ft. flexible container with pressure-seal, rubber-covered zippers will maintain an 80°F. temperature differential for 8 hr. without replacement of refrigerant. It has 6 pockets for 1x10x10-in. dry ice slabs, is equipped with rings for suspension from plane ceiling. Santi-Kraft Corp. introduced the lightweight "refrigerator." —FOOD INDUSTRIES

Inspects Turbine Blades—Used with an optical comparator, the new Pant-O-Jector has a pantograph arm which traces the contour of turbo jet-engine blades. A projection on the arm, which has same shape as follower, is projected onto comparator screen. Shadow traces magnified blade contour so that it can be checked against transparent chart-gage. Universal Engraving & Color Plate Co. developed it. —AMERICAN MACHINIST

Butt Joints on Spot Welder—By removing the tip holders and inserting an attachment developed by Robert W. Hoffman Co., a spot welder is converted to a butt welder for wires or thin-gage sheet metal. Requiring a minimum horn clearance of 7 in., the attachment has alternate face plates of copper alloy and serrated tempered steel. —WELDING ENGINEER

Light Measures Paint—Light in adjustable rod of Acme Color Eye paint meter quickly and accurately measures paint poured into cans. Rod, set by scale knob on rim of measurer, extends into paint; when light reflection no longer is visible, amount set on scale has been poured into can. —BUS TRANSPORTATION



BETTER CLARIFIER—Chemical treatment precipates impurities from water to form a sludge in the new clarifier developed by Liquid Conditioning Corp. Coagulating and softening chemicals feed into the tank above water inlet at bottom and are positively recirculated around baffles. A slow-moving agitator prevents sludge from depositing on bottom of tank, the sludge being collected and thickened in a concentrator for blow-off by automatic desludging. Clarified water is separated by outward radial flow. —CHEMICAL ENGRG.

NEW PRODUCTS

All-around Tool—New Simplex Util-A-Tool will straighten frames, push and pull machinery, clamp parts together for welding, lift and support tractors or other machinery, bend pipes, and pull pinions, bushings, wheels and gears. It includes a push-pull jack, three stud links, a spreader jack, two hooks, a 3-way base, and three ½x40-in. chains with grab hooks and claws. It is made by Templeton, Kenly & Co. —ENGRG. & MINING JOURNAL

Electronic Accelerometer—Rapidly changing accelerations (up to 200 cps.) are measured accurately with an electronic tube developed by National Bureau of Standards. The tube contains a fixed, indirectly heated cathode with a plate on each side, elastically mounted to deflect in response to acceleration. Resulting change in plate current is recorded on oscillograph. —ELECTRONICS

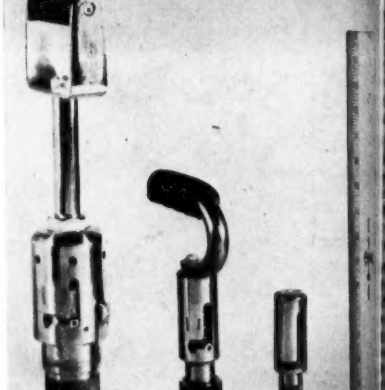
Measures, Dispenses Tape—Cellulose or acetate fiber tapes are measured, ejected, and cut to desired length by lever action in the new tape-saver developed by A-L-B-E Engineering Co. Tape lengths can vary from ⅝ to 3 in. Device is made of stamped stainless steel parts. —BUSINESS WEEK

Machine Sells Beverages—Equipped with an automatic coin changer, a new vending machine sells bottled beverages or a combination of beverages, sandwiches, fruit, cookies, and candy. It is a U. S. Vending Corp. development. —FOOD INDUSTRIES

Gas Curtain Chokes Fire—To help prevent indrafts from sucking air to a fire in dip tanks, fans, and hooded equipment, Walter Kidde & Co. has developed a nozzle which throws a curtain of carbon dioxide gas aoross an opening. Used with a built-in CO_2 extinguising system, the nozzle produces a double screen, one blast of gas shooting across the opening, while a second series of jets aims at an inward angle to dilute air which gets by the first screen. —CHEMICAL ENGRG.

Electronic Limit Switch—For tube-mill thrust-block or draw-bench carriage-return applications, a new limit switch consists of a slide-rail-mounted transformer with a U-shaped magnetic circuit. When actuating plate passes through the U, an electronic control stops the motor. —PRODUCT ENGRG.

Televises Plant Operations—Employing a camera and reflector, two small power units, and a viewer, the Farnsworth Television & Radio Corp. "utiliscope" will televise any production operation from points too inaccessible or dangerous to view during process. Unit weighs 121 lb. Diamond Power Specialty Corp. is joint developer. —BUSINESS WEEK



EXPLOSIVE TOOL—Developed during the war, a time-saving hand tool which uses an explosive cartridge to drive studs into steel or concrete has been made available to industry by Tempo Products Co. The explosion drives a stud through a short barrel with enough force to "weld" it in steel so firmly that it will resist a 20,000-lb. pull. Three sizes are made; the largest will penetrate 1¼-in. steel. —ELECTRICAL WORLD

One-man Dirt Mover—Useful in mining and construction work, a new, 3½-yd. self-loading dirt mover now is in production at the R. G. LeTourneau, Inc., plant. One man can operate it. —ENGRG. & MINING JOURNAL

Chews Up Tree Prunings—Prunings, up to 1½ in. dia., from orchards can be shredded by the Hercules brush shredder and disked under for mulch, eliminating gathering and transportation of trimmings. Shredder was developed by Valley Foundry & Machine Works, Inc. —BUSINESS WEEK

Speeds Grinding—Designed for high output of small parts, a double vertical-spindle grinder introduced by Charles H. Besly & Co. has a horizontal rotary feed wheel into which operator drops small parts. Machine will grind 3,000 to 4,000 small coil springs per hr., for example. —AMERICAN MACHINIST

Heavy Carbon Isotope—Useful as a tracer in biological or chemical processes, a heavy isotope of carbon, C^{13}, is now in production at Eastman Kodak Co. —CHEMICAL ENGRG.

Plastic Rivets—Plexiglas rivets to fasten light metals, plastics, and other materials have been developed by Douglas Aircraft Co. They can be clinched without shock by guns which heat and expand them with air pressure, permitting use as blind fasteners. Colors are available. —AMERICAN MACHINIST

Dries Printed Fabric—An 8-kw. electrically heated pad, 30 ft. x 65 in., weighing 187 lb., produces thermostatically controlled heat to dry printed fabrics. Conductive sheets of rubber, compounded with carbon, are between nonconductive sheets. It is made by Goodyear Tire & Rubber Co. —BUSINESS WEEK

Advanced Lightplane Engine—Developing 120 hp., yet weighing only 150 lb. dry weight, the McCulloch Motors Corp. 3-cyl. supercharged engine employs direct fuel injection. Two pistons per cylinder, horizontally opposed, operate on two cycles, one piston controlling exhaust port, one the inlet port. The engine has two crankshafts which drive a propeller shaft through a pinion at front. —AVIATION NEWS

Theft-proof Label—Designed by Avery Adhesive Label Corp. to prevent removal for fraudulent use on substitute merchandise, a new "self-destroying" label is "invisibly" die marked so it will tear. —CHEMICAL ENGRG.

Coin Television—Tradio-Vision is a new television receiver that can be installed in hotels or public places and operated by inserting coins. Introduced by Tradio, unit has a 5- or 7-in. screen, 500-line definition.—ELECTRONICS

Harvests Potatoes—Food Machinery Corp. has developed a machine to clean and bag 500 lb. of potatoes per hour, formerly the work of 15 people. Used behind a mechanical digger, machine has rubber-covered rollers which remove vines and weeds and cleaning rollers to remove dirt and stones. Adjustable axle permits use on rows of different width. —BUSINESS WEEK

Midget Tricot Machine—A high-speed, table-model tricot knitting machine, produced by American Viscose Corp., eliminates the need to take production machines out of operation to make sample cloth. Samples up to 21-in. width can be made, using small amounts of yarn. —TEXTILE WORLD

FREE SERVICE TO READERS

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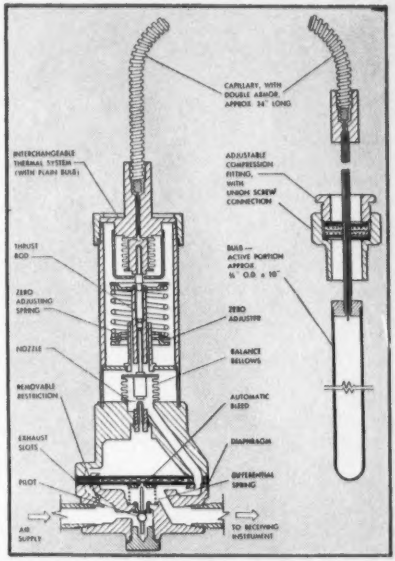


NEW-TYPE THERMOMETER—Pressure in the gas-filled thermal element of the new Nullmatic thermometer is balanced by air pressure, and the latter is transmitted to a remote indicator, recorder, or controller as much as 1,000 ft. away. This provides a remote thermometer with a capillary tube only 24 in. long. Thermal elements of the Moore Products Co. thermometer are interchangeable, giving a minus 150°F. to 800°F. range. A suppression adjustment in the transmitter permits range to be reset over wide limits and also is used for setting the zero. Unit responds to 0.01°F. changes. —CHEMICAL ENGRG.

Water Drives Grinder—Water from faucet rotates die-cast aluminum impeller to drive 3-in. silicone carbide grinding wheel developed by Hudson Products Co. Speed ranges between 3,000 and 10,000 rpm., depending on water pressure. Plastic hose connects grinding wheel to water source. —BUSINESS WEEK

Sheet-metal Stairs—Pressed steel sections which combine stair tread and riser in one piece of formed metal have been developed by Home Ola Corp. Pieces are punched and slotted (for 1-in. riser height adjustment) and can be assembled in 90 min. —PRODUCT ENGRG.

Dry Cleans Floors—Vacuum produced by an 11-in. fan picks up light soilage, and a 16-in. power-driven, steel-wool roller removes heavy soilage when G. H. Tenant Co.'s new machine is used on factory floors. —ELECTRICAL WORLD

More Efficient Gas Turbine

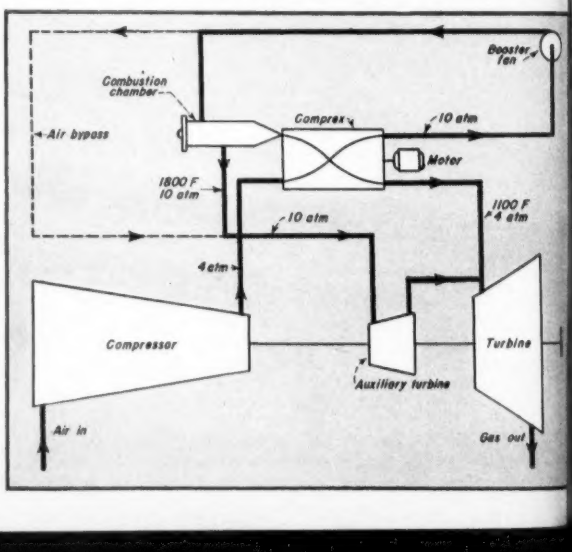
Swiss develop pressure exchanger which increases output and efficiency of open-cycle unit. Also build base-load machines

Largest gas turbines yet under contract are two base-load machines of 13,000 and 27,000 kw. being built by Brown Boveri for installation at Beznau, Switzerland. They will operate in winter when river runoff is low and the supply of electrical energy is limited. In all, 12 gas-turbine sets are in various stages of design and construction. Most interesting technologically is a 3,000-kw. experimental locomotive unit. This incorporates a pressure exchanger, entirely new in gas-turbine application. It acts as a second-stage booster compressor to increase output about 50% over that of a simple open cycle unit.

The locomotive power unit has essentially the same compressor and gas turbine as the first 2,500-hp. locomotive. Exhaust from the compressor, however, passes to the pressure exchanger where its pressure is boosted from 4 atmospheres to more than 10, then a small gas-turbine-driven fan adds some pressure to make up losses in the pressure-exchange cycle and to aid in scavenging.

Practically all of the air goes to the combustion chamber, where the temperature is raised to 1800°F. The main portion of the hot gas passes to the pressure exchanger, together with an equal volume of air, an excess of high-pressure gas resulting from expansion caused by heating. The excess gas flow is available for use in an auxiliary turbine. However, this part of the flow must be tempered from 1,800°F. to a value suitable for the auxiliary by relatively cold air bypassed around the combustion chamber.

The pressure exchanger, called the Comprex, is a constant-speed, motor-driven rotating cylinder carrying a number of helical, longitudinal cells which trap successive air charges. In principle the Comprex acts as a pneumatic ram. As air enters an individual cell at high velocity, a pressure wave is built up by closing off the far end of the cell. Part of the trapped air is valved off at high pressure at exactly the correct time, leaving the remainder at relatively low pressure. The cell now passes another fixed valve plate and receives another charge of hot gas, which is made to ex



Important new gas turbine development, the Comprex pressure exchanger, operates in conjunction with an auxiliary turbine to increase output and efficiency.

pand by an impulse pressure wave to become, in effect, a "hot-gas piston" compressor.

At a circumferential rotor speed of about 650 fps., the individual cells pass the fixed valve plates at 3,000 per sec., the gas and air flows being practically continuous. The rotor contains air at compressor outlet temperature of 400°F., combustion gas at 1,800°F., and the working fluid at intermediate temperatures. So rapid is the transition of each cell from compressor to expansion, however, that the metal temperature departs from an average 1000°F. by less than 2°F. Combined efficiency for compression and expansion is 69%.

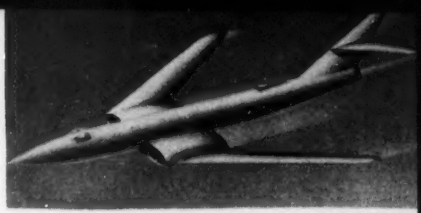
Cell division walls have a helical twist in order to prevent centrifugal segregation of heavier cold air and lighter hot gas. —POWER, ELECTRICAL WORLD

MOTION PICTURES TO AID TECHNICAL INSTRUCTION

Motion pictures and film strips soon will be used to supplement instruction in technical subjects involving McGraw-Hill Book Co. textbooks. Animated drawings, photo-micrography, and slow-motion photography will be used to aid students to visualize the more difficult parts of texts; entire books will not be filmed. Films are already in preparation to accompany "Engineering Drawing," French; "Mechanical Drawing," French and Svenson; "Student Teaching," Schorling; and "Textbook of Healthful Living," Diehl. —BUSINESS WEEK

KEEPS HERRING LONGER

Brine-cured herring keep much longer when treated with a vegetable oil containing nordihydroguaiaretic acid and placed in brine with benzoate of soda. At 70 to 95°F., the fish were edible after 9 weeks' storage; untreated were inedible after 2 weeks. At 40°F., the stabilized fish had a good color, odor, and flavor after 269 days' storage; the untreated were slightly rancid after 55 days. —FOOD INDUSTRIES



TOMORROW'S TRANSPORT — Still in design-sketch stage, this 10-passenger transport is a possibility within the next decade, say NACA engineers. Power would be provided by three turbo-jets, four ram jets, and four jettisonable rocket units. Wings and tail assemblies have 45-deg. sweepback; monowheel landing gear retracts behind wing. —AVIATION NEWS

POWDERED COAL FOR HOMES

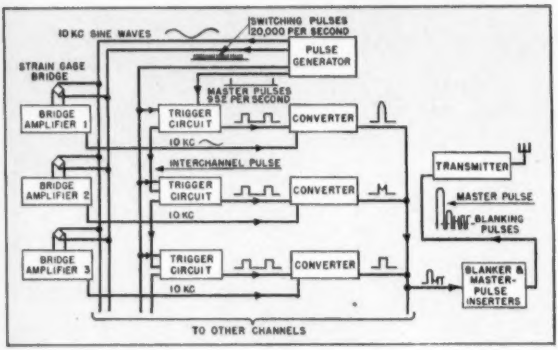
Practicality of powdered coal as a heating agent for multifamily houses will be tested by a Baltimore coal wholesaler. Advantages in powdered coal are cleanliness, simplicity of operation, absence of smoke, elimination of ash. Unit, adaptable to existing heating plants, is sheet metal lined with a refractory. Burner at top of unit provides for vertical downfiring after ignition by gas burner and sparkplug. Powdered coal is moved from separate storage bin to furnace by screw. Control is by thermostat.

Initially, test equipment will be placed in commercial establishments for steam boilers of 75-150 hp. —COAL AGE

SLOTTED-CYLINDER ANTENNAS

Slot radio antennas have been used successfully on high-speed aircraft to establish electric currents on outside metallic surfaces and make the plane itself the transmitting radiator. These antennas have characteristics which make them useful in many other applications as well. They already have found commercial application in frequency modulation and television; simple mechanical construction, easily obtained vertical directivity, and horizontal polarization make them ideal.

A particularly useful form of radiator is a long, narrow, hollow cylinder with a lengthwise slot; directivity is increased by a series of slots, fed by a coaxial cable or parallel wires. —ELECTRONICS



18-IN-1 TELEMETER—Readings of 18 bridge-type instruments in an airplane on test flight are synthesized into a single signal for radio transmission to a ground station by a telemetering system developed at Princeton University. Receiver breaks the signal into components. Transmitter samples each reading 952 times a sec. Pulse generator supplies 10,000-cycle sinusoidal voltage to drive instrumentation, 20,000 switching pulses per sec. phased to occur when sinusoidal voltage crosses zero axis, and 952 master pulses per sec. —ELECTRONICS

PROCESS RENEWS ELECTRODES IN SALT-BATH FURNACE

Deterioration of electrodes in high-temperature salt-bath furnaces is prevented by a new technique developed by Upton Electric Furnace Div. On each side of the pot above each electrode is an overlay of refractory material, and a graphite rod is placed under the overhang. Oxides which form in the molten salt (formation of which deteriorates electrodes) contact the graphite rod, are reduced to metallic state, and form scale on the rod. Contact with the rod increases carbon content of scale and reduces its melting point until it melts and drops onto the electrode below. Then as carbon content of the scale is reduced by the oxides in the bath, it becomes a part of the electrode. Process can be speeded by dropping cast iron into the molten bath. —AMERICAN MACHINIST

DYES AFFECT WARMTH

Variation in cloth warmth can be regulated by proper choice of dyestuffs, according to the American Association of Textile Chemists & Colorists. This will affect the dyeing of cloth for wearing apparel, tentage, awnings, and tarpaulins. Dyes can now be classified into high-, medium-, or low-reflective groups. Tests showed none of the cotton or insoluble azo dyes to be low reflecting, but several vat and sulphur dyes were low reflecting. Other azo and the anthraquinone dyes were high reflecting.

Cellulose fabrics, cotton and rayon, can be dyed with either high- or low-reflecting dyes, temperatures varying several degrees between two extremes. In wools, an increase of 5°F. warmth may be obtained by choosing one of the low-reflecting dyes. —TEXTILE WORLD

WORKER HEALTH PLAN PAYS MANAGEMENT DIVIDENDS

Organized late in 1945, the Labor Health Institute, financed by management for St. Louis Retail, Wholesale, and Department Store Union members and their families, has paid dividends to employers in terms of a more stable working force, lower absentee rates, higher productivity. Cost to union member, nothing, except for drugs and dental restoration work; cost to worker's family, about $1 per visit.

During the first year, 1,900 of the 2,500 eligible used the facilities. A total of 28,000 visits were made to doctors' offices. Twenty doctors made 300 home calls, 1,400 hospital calls, performed 35 major and 100 minor operations, delivered 50 babies. The institute is located centrally in St. Louis' factory district, is governed by a joint committee which is composed of employers, employees, and doctors. —BUSINESS WEEK

What's New in Aircraft

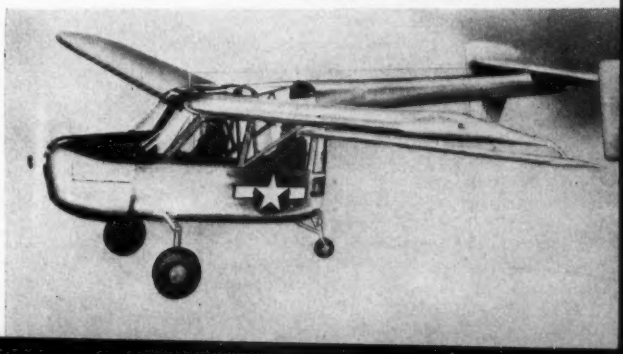
Convair liaison plane employs trailing-edge flap lowerable 45 deg. First jet-powered flying boat announced. DC-6 to be ready soon for commercial lines

Being built in large numbers for the AAF, the versatile Convair L-13 all-metal lightplane is readily convertible for observation, communication, photography, ambulance, wire-laying, courier service, artillery spotting, supply dropping, aerial pickup, or light cargo work. The 2-spar, riveted, folding wings have aluminum-alloy sheet covering and a very large slotted trailing-edge flap lowerable 45 deg. Fixed 96-in. leading-edge slots extend along aileron areas. Powered by 245-hp. Franklin 0-425-5 engine, the craft cruises at 92 mph., has 115-mph. top speed, lands at 43.5 mph., has 368-mile range. It can be towed glider-fashion to 150 mph. and released to fly under own power. —AVIATION

Planet Aircraft, Ltd., England, has designed an all-magnesium, 4-place plane, using no internal stringers, ribs, or formers. Skin, varying in thickness to withstand local stress, is joined by welding. Propeller is mounted behind butterfly-type tail assembly and driven by extension shaft from engine in fuselage. . . . First jet-powered flying boat, the SR/A1, built by Saunders-Roe, Ltd., England, will be powered by two Metro-Vickers F2/4 axial-flow jets, each developing 3,500 lb. static thrust. Air for engines is through nose port, closed while boat is on the water. Gas exhausts are located aft of the wing roots. The high-wing, single-seat fighter has a 46-ft. wing span, 50-ft. length, 17-ft. height.

Hamilton Helicopter, Inc's new 2-place, 125-hp. helicopter will employ hydraulically operated controls mounted in rotor head and operated by wheel instead of the standard rudder and stick. Hydraulic controls will reduce vibration. Plane will weigh 1,200 lb., including passengers and fuel load. Cruising speed will be 90 mph.; max. speed, about 100 mph. Price, about $5,000 . . . A 5-place, 2-engine plane with an 8-ft. propeller mounted behind the tail assembly is to be marketed by Douglas this year. The low-wing, all-metal monoplane will be called the *Cloudster*. Cabin is mounted ahead of wing; Continental 250-hp. engine is mounted in fuselage. Service ceiling is 11,800 ft., rate of climb 1,500 ft. per min. at sea level. Statistics: wing span, 39⅔ ft.; height, 12 ft.; overall length, 35⅓ ft.; max. range, 1,100 miles.

Latest plane prepared for transonic test flights is the Douglas D-558 *Skystreak*, powered by a General Electric TG-180 axial-flow turbojet, developing 4,000 lb. static thrust. To test usefulness



NEW LIAISON PLANE—Boeing's L-15 permits all-around vision for military liaison. Plane has reverse tail surfaces, can be towed 165 mph. Cruising speed is 101 mph.; flying speeds range from 53 to 112 mph. Plane will clear 50-ft. obstacle after 600-ft. takeoff; it lands in 517 ft. Wing span is 40 ft.—AVIATION NEWS

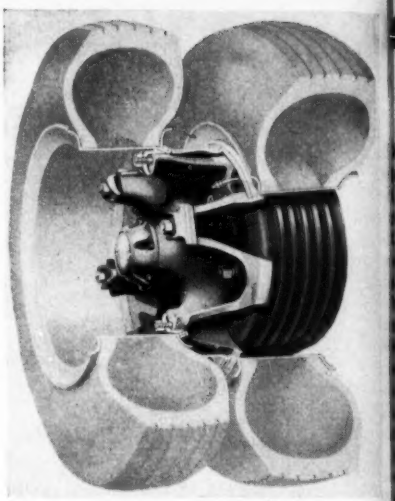
of low-aspect-ratio wings in transonic zones, it will have conventional spar-rib-skin wings. Plane is of magnesium construction; load will be carried by skin alone without longitudinal stiffening . . . Consolidated-Vultee's XC-99, double-decked version of the XB-36, will carry 400 passengers or 10,000 lb. of cargo. Six Pratt & Whitney R-4360 engines produce 3,500 hp. at sea level, giving plane a max. range of 8,000 miles with reduced load, and a speed exceeding 300 mph. Fuselage is 182½ ft. long; wing span, 230 ft. —AVIATION NEWS

Douglas 4-engine, 300+-mph. DC-6 is expected to be ready for commercial flights soon. A blowup of the DC-4, it will have the same wing spread but a 7-ft. longer fuselage. Four Pratt & Whitney 2,400-hp., twin-row, radial engines replace the 1,350-hp. plants in the smaller version. The cabin will be pressurized, permitting a service ceiling of 26,500 ft. Sleepers will accommodate 26 sleeping passengers or 52 sit-up passengers; models not designed for overnight hops will seat 58. With full complement of passengers and 5,000-lb. cargo, plane will cruise 2,700 miles nonstop. Ultra-modern cabin will include separate men's and women's lounge, all-electric buffet, Pullman-type seats. —AIR TRANSPORT

Production is continuing on the first Boeing B-50, successor to the B-29. Principal changes will be a 5-ft. higher tail and larger nacelles carrying Pratt & Whitney 3,500-hp. engines. Engineers have made 600 changes in the interior constructions. —SCIENCE ILLUSTRATED

PORCELAIN-ENAMEL HOUSES

Homes with interior and exterior walls and roofs of porcelain enamel are being prefabricated by Lustron Corp. Framework of the 32x36-ft. house is of light-gage steel members in 8x8-ft. sections. Panels have interlocking edges, covered with resilient plastic gasket. Interior arrangement is easily shifted; walls carry radiant heating pipes. Floors are asphalt tile. —ENGRG. NEWS-RECORD



STRONGER WHEELS—Diagonal bracing in Gunite Foundries Corp.'s new cast steel wheels gives greater carrying power and stiffness than standard spoked designs through higher strength-weight ratio. Folded web, giving appearance of spokes, produces staggered rim seats and greater assembly strength. Lugs are pulled down on "floating" bolts, allowing no rim slip. —BUS TRANSPORTATION

BIG METALWORKING SHOW TO BE HELD SEPT. 17-26

At the world's largest exposition of a single basic industry—the 1947 Machine Tool Show—more than 250 exhibits of machine tools, forging machines, and other metalworking equipment will be shown in actual operation. To be held September 17 to 26, the exposition will occupy more than 500,000 sq. ft. in the Dodge-Chicago plant near the Chicago Airport.

This is the first show sponsored by National Machine Tool Builders Assn. since 1935. The last one was attended by more than 60,000 industrial executives and technical experts from every industrial nation in the world. Large attendance from abroad is expected this year. —*Special Report to McGraw-Hill Digest*

Output of Durable Goods Up

Big year seen as steel production hits new high and more motors and castings are available. Machine tool volume up; huge surplus for sale

Extraordinary activity in the U. S. metalworking industries seems assured throughout 1947. Tonnage of metals available, particularly of steel, will be the production-rate determinant for many companies. Metal production has struck new highs in recent months. Just before the close of 1946, steel output reattained the 1941 rate of more than 80,000,000 ingot tons, and a smaller share now goes to military use. Mill shipments of sheet and strip have been nearly one-sixth greater than in 1941. Copper has come back to prewar volume, aluminum is running far ahead, and plastics are moving at half a million tons a year, which dwarfs any peacetime experience.

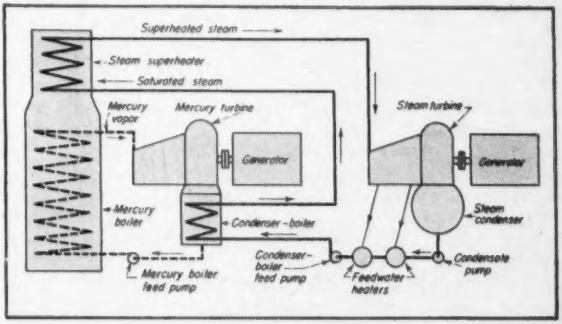
Further gains are in sight. Expanded capacity will come into operation in such cases as flat-rolled steel. Decontrol of prices will bring in more lead, scrap steel, and similar materials.

While production of new machine tools in 1946 exceeded all prewar years by a good margin, shortages of components, such as motors and castings, seriously hampered metalworking operations. Motor output, however, has almost quadrupled since the end of the war. Castings have rebounded, and production at the end of 1946 was greater than on V-J Day.

The war-surplus of machine tools remains at staggering proportions. The government still has 395,000 units for sale, and these machine tools are being offered at only 25-30% of the original prices.

New production records in many lines of durable goods should be set this year. The automobile industry expects to build 5,000,000 cars and trucks. In farm machinery the goal is for a new record of a billion dollar volume. Other metalworking industries, such as those making railroad equipment and refrigerators, expect to do at least as well proportionately.

An increasing number of machine-tool companies are completing redesigns of their machines. The wartime trend toward greater precision in manufacture has become a permanent policy. Another trend is better handling of materials within metalworking shops to increase production and to cut costs. Machining methods have been so speeded that the amount of machining work which can be done often is determined by the time it takes to get the workpiece into and out of the machine. —AMERICAN MACHINIST



MORE POWER—With mercury-steam plant, net heat rate will be 2,000 to 2,500 Btu. per kwh. better than for steam cycles. Mercury vapor from boiler enters mercury turbine, exhausts to condenser-boiler at high temperature; liquid mercury returns to boiler. Saturated steam from condenser-boiler flows through superheater, steam turbine, condenser. Condensate returns to condenser-boiler through heaters. System can be used for topping low-pressure steam plants, and in new plants. First cost is higher. —POWER

GERMANS DEVELOPED CELL FOR ELECTROLYSIS OF HCl

Chlorine was recovered from byproduct hydrochloric acid in a novel electrolytic unit developed in Germany. Built like a filter press, the cell had 30 unit cells in series, each operating at 2.3 volts at 1,000 amp.

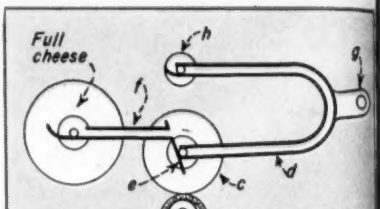
Each unit cell contained graphite slabs in an insulating frame, the graphite being smooth on the anodic side, ribbed on the cathodic side. A polyvinyl chloride cloth diaphragm covered one face of the frame, and scrap graphite filled the space between the anode of one section and the diaphragm of another. Acid flowed into the anode compartment, up through the broken graphite, through the diaphragm, into cathode compartment and out. Some dissolved chlorine carried over into the cathode compartment, and this, together with leakage current, gave a 92-94% efficiency. Both Cl_2 and H_2 were scrubbed with water to remove HCl. After washing, the anode gas was 99.9% $Cl_2 + CO_2$, of which 0.2-0.4% was CO_2.

An unusual feature was that the replenishable scrap graphite was consumed and there was no attack on the plates.

To produce a ton of chlorine cost an estimated $17.56 without credit for 10,000 cu. ft. of H_2. Cost of electricity was $8.96 for 1,790 kwh. —CHEMICAL ENGRG.

BUSINESS IN QUONSET HUTS

Western Metal Supply Co. is retailing quonset huts in package form and looks forward to a bright business future, even after immediate building backlog is satisfied. Sold in 20-, 24-, and 40-ft. widths in standard increments of 20 ft. for 40-ft. widths and 12 ft. for 20- and 24-ft. widths, multiple building can be extended to any desired length. Huts are wholly of steel construction, except windows, doors, and concrete foundation and flooring. Buildings range from $1.70 to $2.00 per sq. ft. of floor space and can be erected by purchaser. Cost includes foundation and flooring. —MILL SUPPLIES



TRANSFERS CHEESES—Found on a German yarn winder by U. S. Army technical teams, this device permits continuous production of rayon filament yarn by automatically removing full cheese and replacing it with starter. Team believes device could be modified for winding spun yarn for bobbins in a magazine creel. When cheese (c) is full, starter (h) moves down slot (d), pushes (c) into slot (f), and moves into position between slot (e) and drum (b). —TEXTILE WORLD

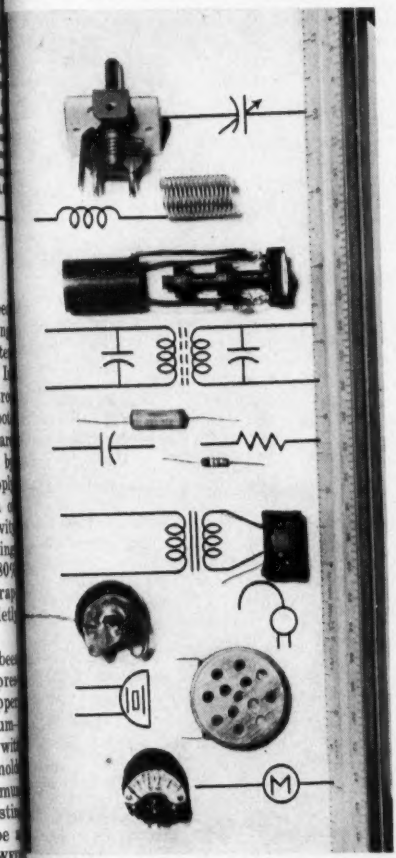
COUNTER-GRAVITY CASTING IMPROVES QUALITY

Armour Research Institute has developed two methods of counter-gravity casting for ferrous and nonferrous metals after three years of pilot-plant operation. In pressure casting, gas pressure is introduced to force metal flow from teapot-type ladle; in vacuum casting, molds are inclosed in a vacuum bell, connected by refactory tubes to molten-metal supply placed below mold level. Evacuation of bell sucks up metal. Counter-gravity pouring gives denser, cleaner castings, cuts rejects to 1-2%, gives 75-80% metal recovery. Slag and air entrapment are reduced, as metal moves quietly from below slag surface.

In pilot-plant operation, steel has been vacuum-cast; iron, vacuum- and pressure-cast. Nonferrous metals—copper, brass, bronze, aluminum, magnesium—have been cast in permanent molds with sand cores. Grey iron and sand molds are used for ferrous metals. Maximum height of vacuum- or pressure-casting is 20 in., length of casting may be as great as 50 ft. —BUSINESS WEEK

PROGRESS IN MIDGET ELECTRONIC EQUIPMENT

Wearable broadcast receivers are in production. A one-tube field intensity meter, small enough to be held in the palm of one's hand, has been used to catch people illicitly using concealed radios, as for relaying horse-race results to gamblers or placing bets after a race is over but before the results are known generally. A boon to reporters and others who must record what is said verbatim will be a portable magnetic wire recorder.



Midget parts for midget electronic equipment.

An inch-long Geiger counter tube of such small diameter that it can be inserted into one's veins to meter passage of radioactive tracers has been developed.

Most of the major types of subminiature electronic tubes are commercially available. Most recent development is the CK521AX beamed-power tube. A thin metal window concentrates electrons moving to plate into a dense beam which suppresses secondary emission. To reduce filament-heating power, the tube has a common filament for the two space-charge tetrodes of which it consists. The first grid, extending through both sections of the tube, is used as a positive space-charge grid to produce a virtual cathode. The electron cloud formed at the first grid provides a reservoir of electrons for the two independent triode sections.

Midget capacitors, resistors, and other components for miniature electronic equipment are available, and their performance is good considering their size. A new dry battery with mercuric oxide and zinc electrodes has high ampere-hour capacity, negligible polarization, and nearly constant output voltage and internal resistance. —ELECTRONICS

PUMPS FISH FROM BOATS

Fish storage tanks of fishing vessels are flooded with water, and small fish are pumped through flexible, rubber hose to the Peacock Cannery. The 6-in. dia. hose will transfer 65 tons of fish in 50 min. A separate small-dia. hose is used to pour water into the tanks. —BUSINESS WEEK

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F. K. LAWLER, Editor

J. H. McKEE, Jr.
Assistant Editor

SHELBY McMILLION
Business Manager

FREDERIC C. THIEME
Advertising Manager

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